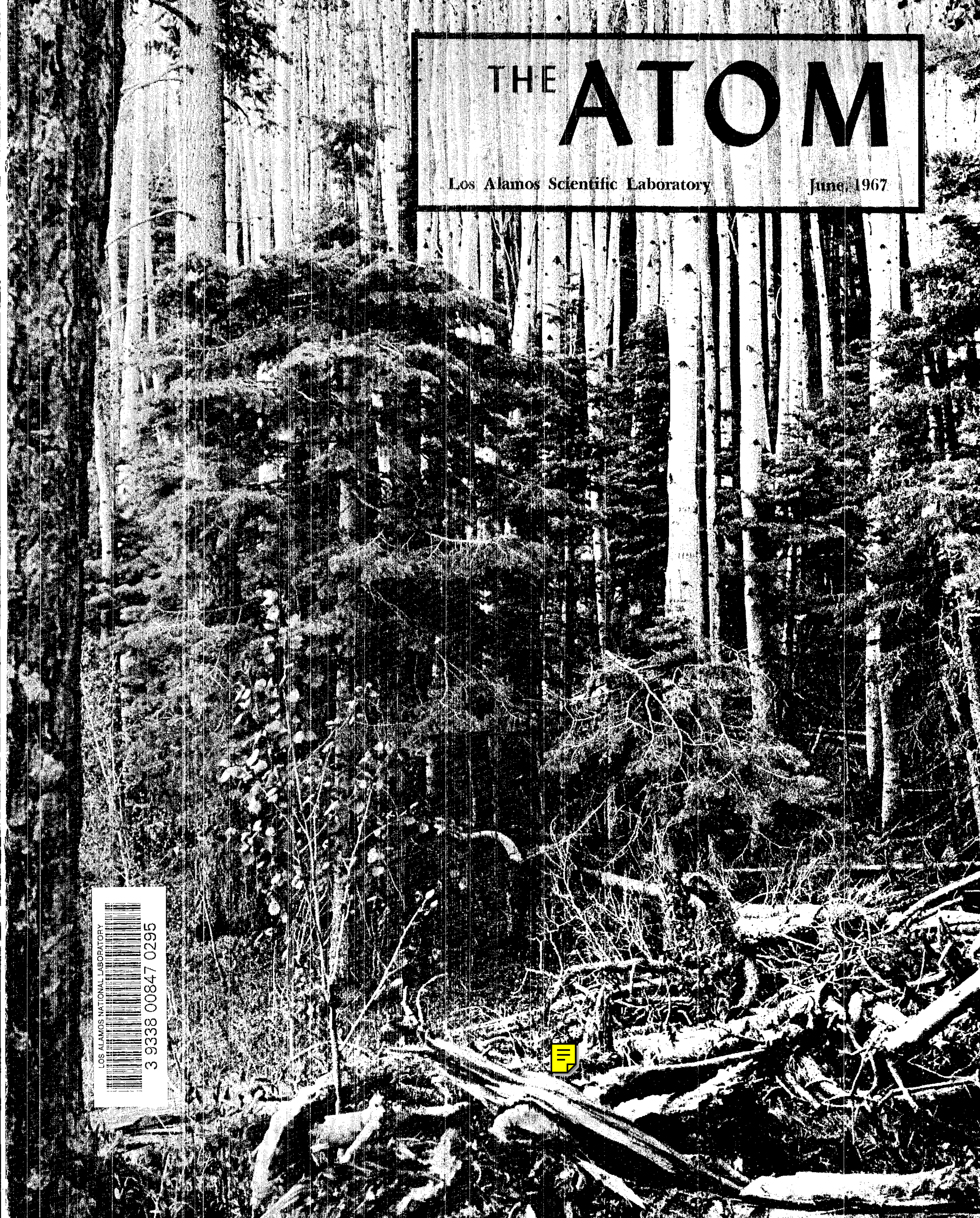
THE ATOM

Los Alamos Scientific Laboratory June, 1967



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THE ATOM

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COVER:

Pub photographer Bill Jack Rodgers produced this black and white version of "Aspen Child"—typical of springtime in Los Alamos. Rodgers' color print of the photo won first place at the recent New Mexico Industrial Photographers Association convention held in Los Alamos.

short subjects

Dwight Stephenson, J-8, and **Raymond J. Hanson,** N-4, will leave soon for Kanpur, India, where they will work with the Indo-American program at the Indian Institute of Technology on the Kalanypur campus. Both men will be on a year's leave of absence from LASL.

Stephenson, an electronics engineer with LASL since September, 1956, will be working with the Indian facility in establishing course material, content and laboratory procedures in solid-state electronics, as well as acting as an advisor to graduate students. In addition, he plans to consult on a new university industrial park being established adjacent to the campus. Stephenson received his B.S. degree in electrical engineering from California State Polytechnic, San Luis Obispo.

Hanson, an analog computer equipment technician with N-4, has worked for LASL since August, 1951. While he will assist Stephenson, Hanson plans to conduct several electronics classes of his own.

The families of both men will accompany them to the new assignment.

Stephen D. Stoddard, CMB-6, was installed as a trustee for the nuclear division of the American Ceramic Society at its annual meeting last month in New York City. The eight trustees elected, each representing a separate division, will govern the Society for the next three years. Among their responsibilities is approval of budgets and programs for the society. Stoddard is also a member of a four-man steering committee chosen last year which has charge of the society's technical program. With Los Alamos Scientific Laboratory for the past 15 years, Stoddard received his B.S. degree in ceramic engineering from the University of Illinois, Urbana. In 1964 he was chosen the nation's Outstanding Young Ceramic Engineer by the National Institute of Ceramic Engineers. Stoddard is a member of the Los Alamos Board of County Commissioners.

James T. Waber, a LASL employe from 1947 until late last year, has been chosen to receive the Illinois Institute of Technology alumni association award for outstanding professional achievement. Waber earned his B.S., M.S. and Ph.D. at Illinois Tech. A CMF-5 staff member, he left Los Alamos to accept a professorship in materials science at Northwestern University.

Schreiber Elected Nuclear Society President

Raemer E. Schreiber, technical associate director of the Los Alamos Scientific Laboratory, has been elected president of the American Nuclear Society. He will take office June 15 at the 13th annual ANS meeting in San Diego.

Schreiber has been with the Laboratory since its inception in 1943, coming to Los Alamos from Purdue University, where he had worked on the Manhattan Project since 1942. At Los Alamos, Schreiber headed the team that designed and built the Water Boiler, first nuclear reactor to operate on enriched uranium. He was a member of the assembly teams for the Trinity test of the world's first atomic bomb and also at Tinian for the two atomic weapons used in combat. He headed the nuclear assembly team for Operation Crossroads, the weapons tests at Bikini in 1946.

Schreiber was alternate W division leader from 1947 to 1951, when he became division leader. In 1955, he was named leader of the newly-formed N division and in 1962 became technical associate director for the Laboratory.

He earned his B.A. degree at Linfield College, McMinnville, Ore., his home town; his M.A. at the University of Oregon and his Ph.D. in physics at Purdue University. He was also awarded an honorary doctor of science degree by Purdue in 1964.

Schreiber is a fellow of the American Physical Society, the American Nuclear Society and the American Institute of Aeronautics and Astronautics and is a member of Sigma Xi and Sigma Pi Sigma honorary societies. He has served on the ANS board of directors since 1962 and was ANS vice president last year.

Schreiber

more short subjects . . .

John C. Biery, K-2 staff member, left in May for a three-month stay at the University of Florida, Gainesville, on a professional research and teaching leave assignment. While there, he will teach an undergraduate course in process control in the chemical engineering department and will also serve as a consultant. Dr. Alan Randolph, a University of Florida instructor, in turn will be at LASL for the same period as a visiting staff member. Biery received his B.S. degree from the University of Michigan and his Ph.D. degree in chemical engineering from Iowa State University.

Richard J. Kandel, W-8, left early this month for Washington, D.C., where he will be associated with the chemistry programs branch of the Atomic Energy Commission's division of research. Kandel will be on a two-year leave of absence from LASL for this assignment. The chemistry programs branch, under the leadership of Dr. A. R. Van Dyken, has responsibility for administering all chemistry research funds and programs of the AEC, in addition to handling requests for funds from universities, such as fellowship and grants. Kandel received his B.S. and Ph.D. degrees in chemistry from New York University and has been on the LASL staff since September, 1950.

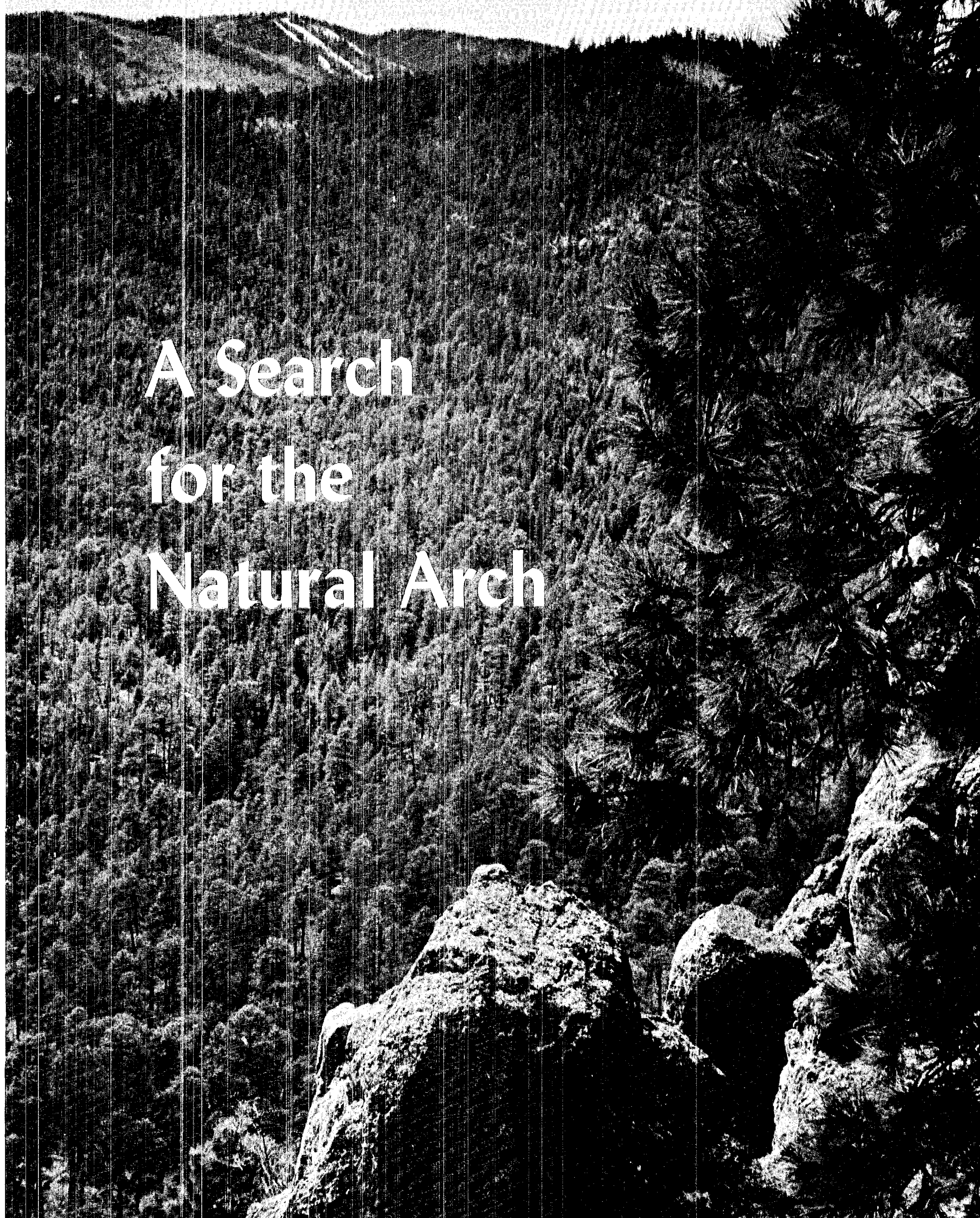
Weapons division leader **Harold M. Agnew,** chairman of the Army Scientific Advisory Panel, presided at the spring meeting of the panel last month at Fort Monmouth, N.J. Much of the three-day meeting was devoted to briefings and discussions of military operations at night and during low-visibility conditions caused by fog and smoke. Briefings were conducted by officers, scientists and engineers of the Army Electronics Command and the Army Combat Developments Command. Purpose of the panel, which is comprised of both officers and civilians, is to advise the Army on matters relating to defense systems.

Charles C. Campbell, manager of the Los Alamos Area Office of the Atomic Energy Commission from June, 1962, to February, 1967, has been named assistant manager for administration at the Albuquerque Operations Office. He replaces Ralph P. Johnson, who retired last month. Campbell has served as deputy assistant manager for administration for the past year.

Gaelen L. Felt, former LASL staff member, has been elected to the board of directors of EG&G, Inc. Felt, who served as J-15 group leader and assistant J division leader while at LASL from 1950 to 1957, was instrumental in the development of the Nevada Test Site. He became deputy test director of NTS in 1955 and was commander of Task Group 7.1 during "Redwing," the 1956 test operation overseas. From 1957 to 1959, he was a consultant to LASL. Felt is now vice president of EG&G's technical support group.

Assistant Health Division Leader **Wright H. Langham** has been named by the Federal Aviation Agency to a standing committee for radiation biology aspects of the supersonic transport. Purpose of the committee will be to advise the FAA in the assessment of the radiation levels to be found at the cruising altitudes of the SST and to advise the federal air surgeon and his staff on the biological significance of these radiations and on the health factors associated with transient or extended exposure. There are 11 members on the committee.

Harry Allen, right, Supply and Property department head, admires certificate of appreciation presented to Horace Noyes, SP-DO, for his part in an AEC-appointed committee which recommended revisions in regulations governing interstate shipments of radioactive materials.



A Search for the Natural Arch

A misty view of Los Alamos through the trees gave promise of an even more spectacular scene through the natural arch.

PRECEDING PAGE: An unexpected dividend from one of the several climbs which ended in an impasse was a view of Pajarito Mountain ski area at top left.

REPORT TO THE ATOM EDITOR
Re: Natural Rock Arch of the North Community
From: William H. Regan

For your information—the natural rock arch of the North Community should be referred to as the "lost arch."

You may recall the rash of phone calls we have received in the past two months suggesting that The ATOM have a picture of the local version of Rainbow Bridge. Most callers offered to show the way but displayed a lack of enthusiasm for providing a map. Everybody seemed to be in agreement that it is difficult to find, unless one had been taken on the trek by a hiker who had been there. Identity of the first link in this outdoorsmen's chain letter is unknown.

Hikers familiar with the area kept mentioning what a beautiful sight it is to come clambering up the last steep pitch and to suddenly and unexpectedly see Los Alamos framed in a natural arch. Nobody, however, seemed to be able to draw a map showing a topographical illiterate like me how to get there alone. Well, as you may have guessed, this intrepid member of the fourth estate finally took the easy way and conned a friend—who had been there—into serving as guide.

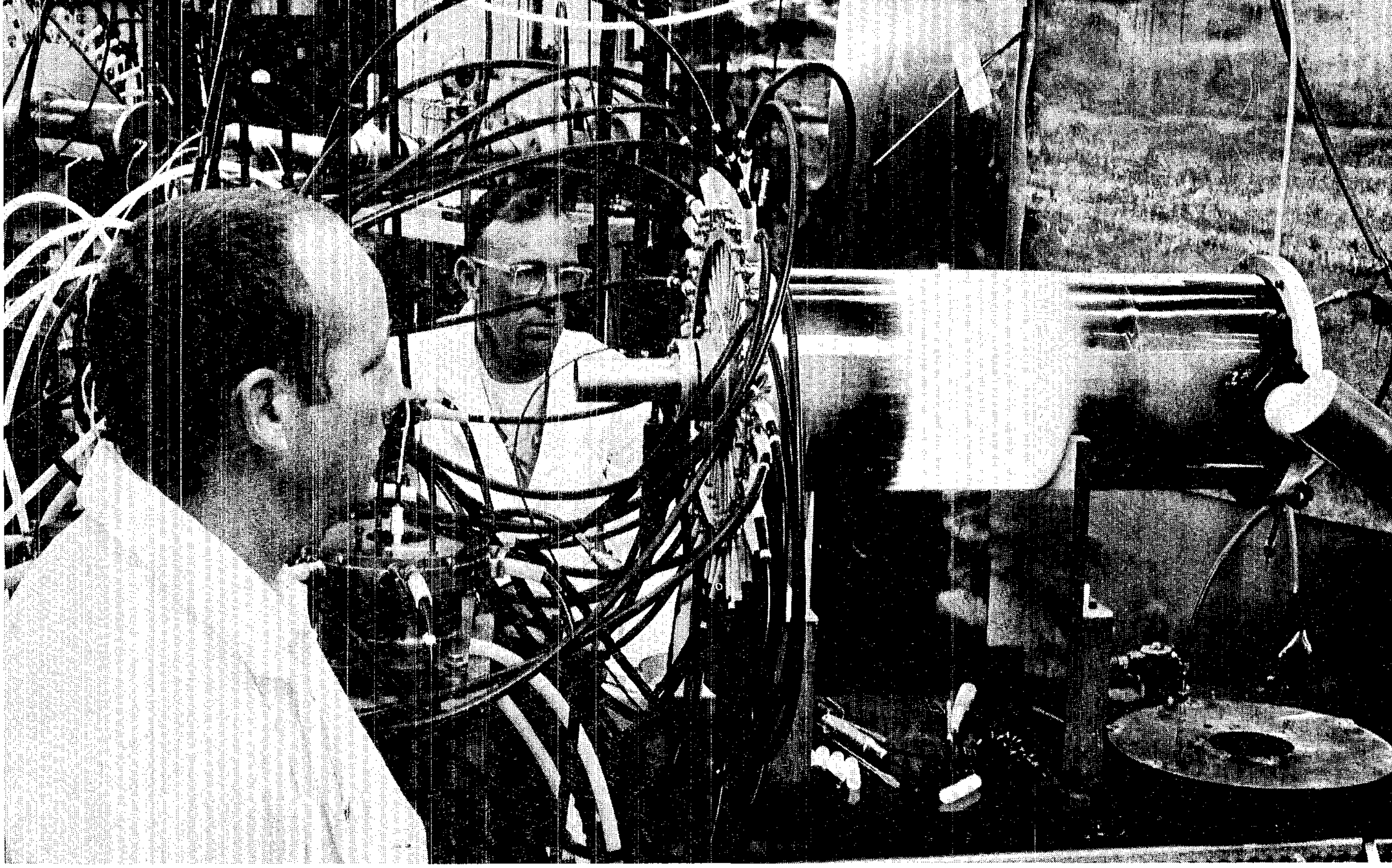
The ATOM plan was to go, photograph and, as a public service, provide a map and instructions for other eager hoofers. In fact, Madame Editor, you mentioned something about how nice it would be to have an easy hiking story with photographs.

Hikers ready! Forward!

Starting at the intersection of 45th and 46th Streets near the Yucca Street playground, take the footpath leading uphill toward the back rocks. About 300 yards uphill, the path crosses an old wood cutters' road that comes in from the left and probably leads to the Pipeline road. Follow the road for about 100.3 yards and then take the first trail to the right leading to the well-known back rocks used by rock climbing trainees.

It was here that we met Ernie Anderson, H-4, suitably accoutered in hard hat, mountain climbing shoes, belt hung with pitons and other equipment. He was on his way back to civilization to guide prospective mountain climbing school students to the back rocks, scene of a Los Alamos Mountaineers, Inc., laboratory session in belaying techniques. Anderson's parting comment was, "The arch—that's a nice hike, a beautiful view, a fine picture for The ATOM. You can practically see it from here."

A gently meandering trail stretched out ahead of us. It descended to what looked like a creek bed which probably only runs during a heavy downpour. This would be a delightfully cool stroll in the summer. It's shaded, and the upward climb starts gradually. This day it was a little cold, for it was overcast and occasionally a few snow flakes drifted down.



Robert Henson, left, and Glen Livermore watch a low-power demonstration of the dense plasma focus device. At higher powers the operators move behind a radiation shield and observe the reaction on closed-circuit television.

Dense Plasma Focus: New Source Of Neutrons

By BOB MASTERSON

SCIENTISTS attending the Seminar on Intense Neutron Sources held in Santa Fe last September got into a lively discussion after P-7 Group Leader Joseph Mather described a new intense pulsed neutron and x-ray source, called the dense plasma focus device, developed by his group. The many scientists present involved in the design, construction or use of large pulsed neutron sources (nuclear reactors or particle accelerators) costing up to several million dollars were impressed to learn that the dense plasma focus—which costs in the neighborhood of $10,000 to build—can compete in some instances with their more expensive devices. So Mather's paper was followed by an animated discussion of the relative costs per neutron of accelerators and reactors as compared to the new source.

It is not surprising that a new type of neutron source would be of

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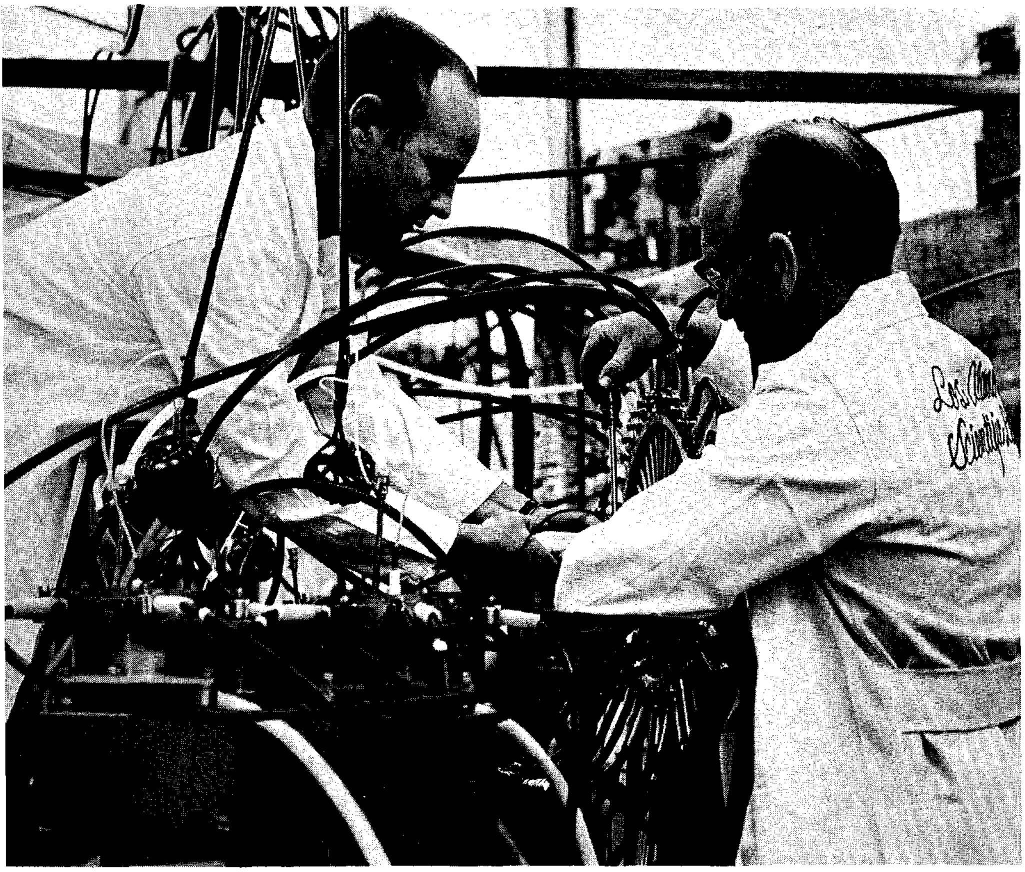

Robert Henson, left, and Doyle Allsman adjust the center electrode on a dense plasma focus device.

Dense Plasma Focus . . .

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great interest to nuclear scientists, because for the past 30 years or so —since its discovery in 1932 by Sir James Chadwick—the neutron has had a great influence upon the exploration of the nucleus and the search into the ultimate nature of matter. Neutrons, as one of the fundamental constituents of matter, are studied in themselves and are also one of the most powerful tools available for studying matter, not only on the nuclear but on the atomic and molecular levels as well.

Neutron absorption, in which a neutron enters the nucleus of the target atom and becomes part of it, results in a new isotope which is usually radioactive. These radioactive isotopes may be studied to gain insight into the structure of the nucleus or may be used in science, medicine and industry as radiation sources, as radioactive tracers or as indicators of metallic trace element composition in the newly-developed technique of neutron activation analysis.

Neutron scattering, in which neutrons are bounced off other materials, provides valuable new information on the atomic or molecular structure of the target—for example, crystals or liquids.

The earliest neutron sources comprised small capsules containing a light element, usually beryllium, mixed with a radioactive isotope, such as radium-226 or polonium-210, which emits alpha particles (helium nuclei). The alpha particles interact with the beryllium nuclei to produce a carbon nuclei and neutrons. In the notation used by nuclear scientists this reaction is: $Be^9 + He^4 \rightarrow C^{12} + n$.

As particle accelerators were developed in the 1930s and '40s they were used to provide more intense beams of neutrons by bombarding targets with energetic particles to produce a nuclear reaction involving the release of a neutron. The most common example would be the bombardment of a lithium target by accelerated protons (hydrogen nuclei) to produce beryllium nuclei and neutrons: $Li^7 + H^1 \rightarrow Be^7 + n$.

Then, in 1942, the nuclear reactor, a neutron source many thousands of times more powerful than previously existing sources, was developed and quickly put to use providing neutrons for nuclear research. In a nuclear reactor, the neutrons result from the fission reaction in which a neutron strikes a uranium-235 nucleus, causing it to split and emit two or three neutrons.

The Los Alamos Water Boiler reactor, built in 1943, was one of the very first neutron source reactors. Since then, hundreds of such reactors, including some designed to give short intense bursts of neutrons, have been built all over the world.

These earlier neutron sources, ranging from a few hundred dollars worth of polonium-beryllium mixture to the $25,000,000 reactor currently under construction at Argonne National Laboratory, have now been joined by the dense plasma focus, which produces neutrons by means of yet another type of nuclear interaction--the thermonuclear or fusion reaction.

In thermonuclear reactions--so called because they can occur only at temperatures of millions of degrees Fahrenheit--very light nuclei, such as hydrogen, helium, lithium or beryllium, fuse together to form heavier nuclei.

In the process, some mass is converted into energy, and in two such reactions neutrons are produced. These two reactions involve the fusion of two hydrogen isotopes. Natural hydrogen consists of two non-radioactive isotopes--hydrogen-1 (H^1) with a nucleus consisting of just a proton, and heavy hydrogen or hydrogen-2 (H^2), also called deuterium (D^2), with a nucleus consisting of a proton and a neutron. There is also an even heavier isotope of hydrogen. This isotope, hydrogen-3 (H^3), also called tritium (T^3), does not exist in nature but must be made in a nuclear reactor. It has a nucleus consisting of a proton and two neutrons.

In the thermonuclear reactions with which we are concerned, a deuterium nucleus fuses with another deuterium nucleus to form a helium-3 nucleus and a neutron; or a deuterium nucleus fuses with a tritium nucleus to form a helium-4 nucleus and a neutron:

$$D^2 + D^2 \rightarrow He^3 + n + \text{energy}$$
$$D^2 + T^3 \rightarrow He^4 + n + \text{energy.}$$

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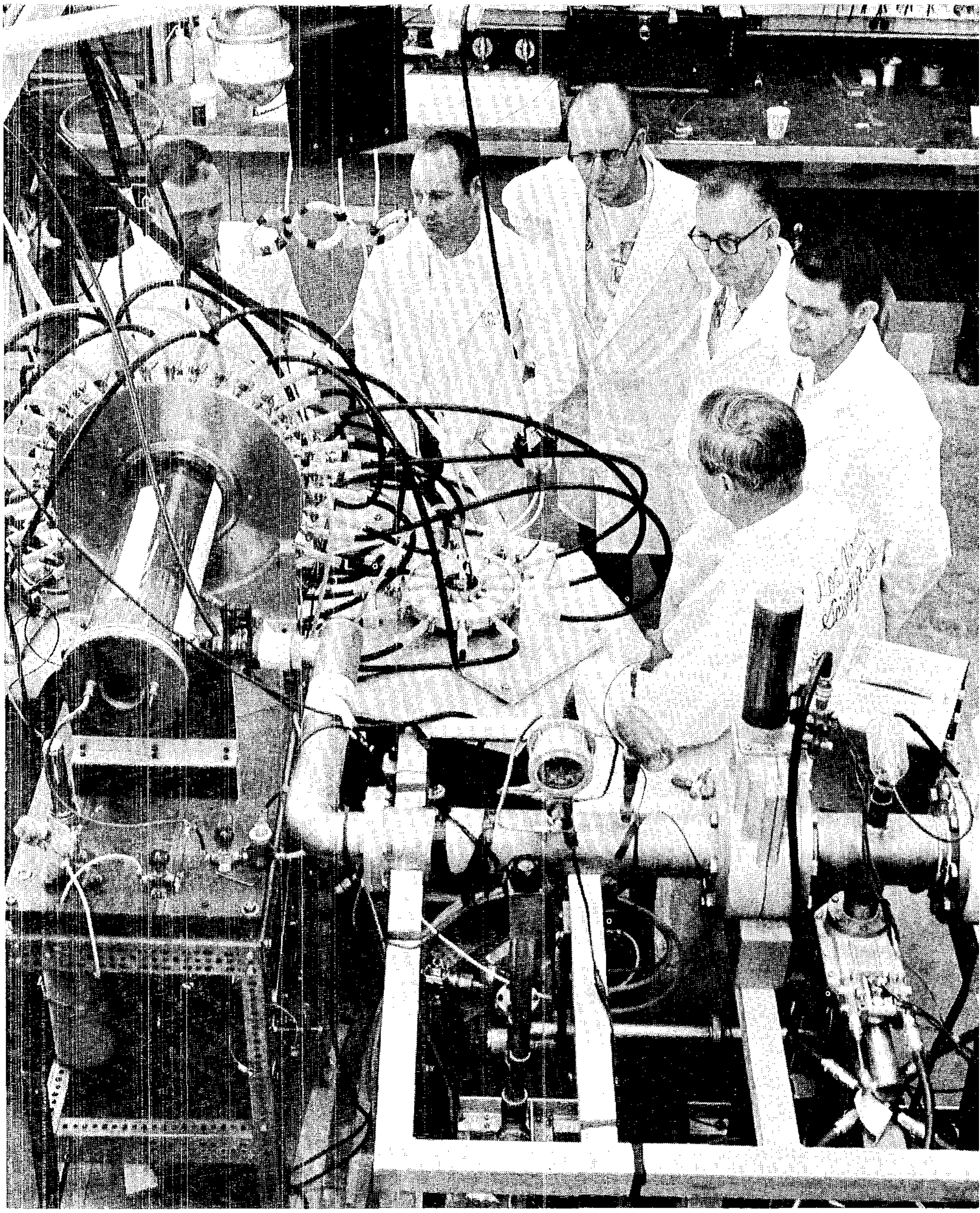
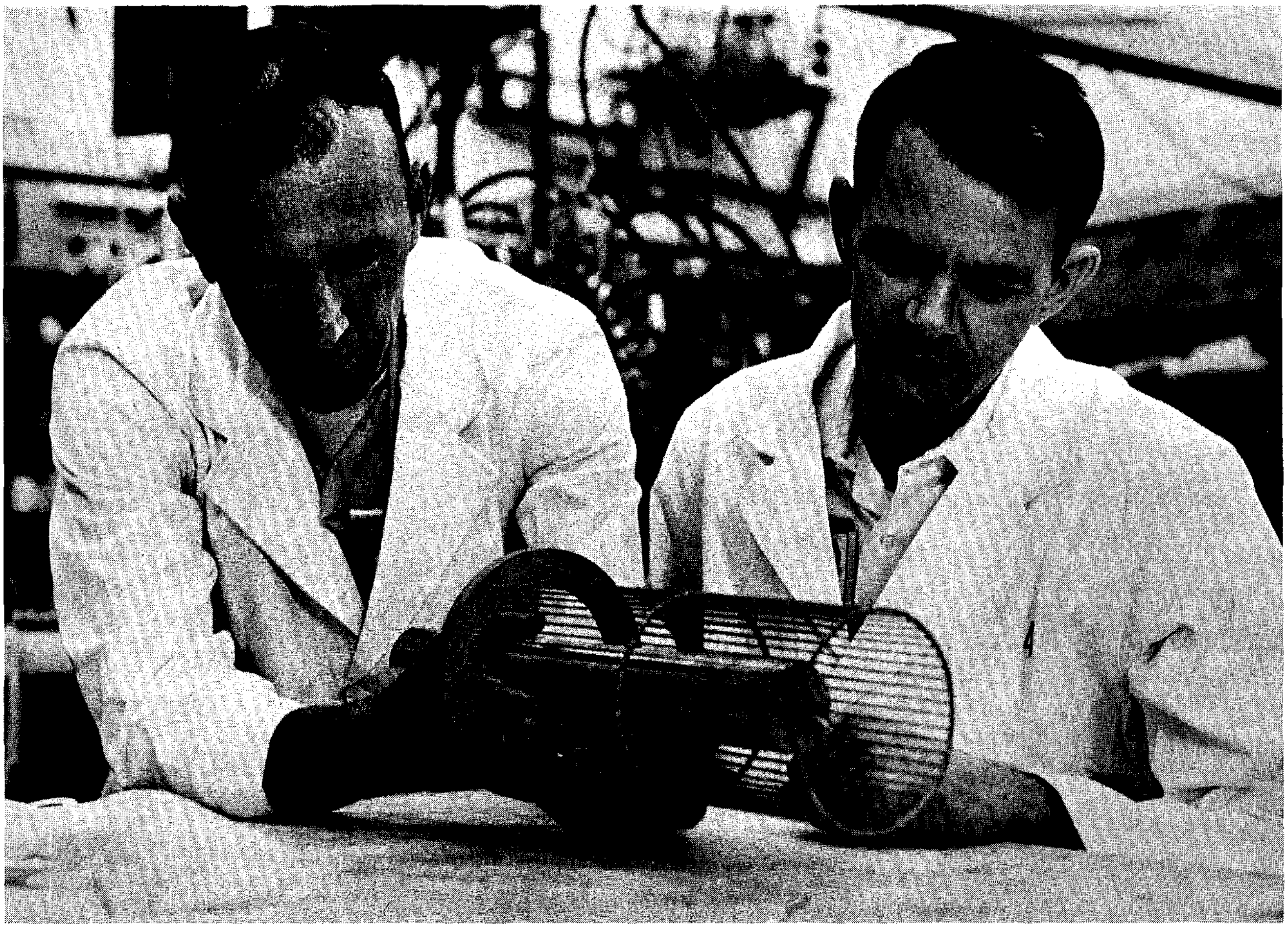


Joseph Mather, foreground, discusses the latest plasma experiments with the members of his group, from left, Glen Livermore, Robert Henson, Doyle Allsman, Art Williams and Paul Bottoms. The circular array of leads connects the condenser bank to the outer electrode. In the right foreground is the vacuum pump connected to the glass chamber by the large copper pipe.



Glen Livermore, left, checks positions of the two electrodes in dense plasma focus device as Paul Bottoms looks on.

Dense Plasma Focus . . .

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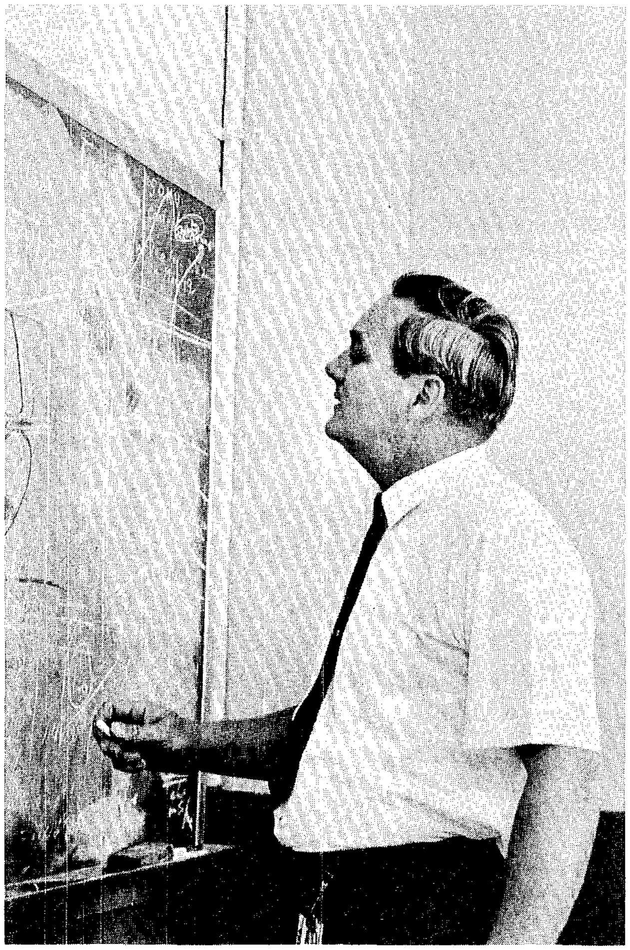
Even though only 0.015 per cent (one atom in 6,700) of hydrogen is deuterium, this is enough to supply the entire world's energy needs for the next billion years if the deuterium thermonuclear reaction could be controlled. It was in the Project Sherwood program at Los Alamos, which has as its goal the construction of a controlled thermonuclear reactor producing useful amounts of power, that the work on the dense plasma focus originated some seven years ago.

The latest model of this device produced by P-7 personnel consists of two concentric, cylindrical copper electrodes nine inches long. The inner electrode, whose end is closed, has a diameter of two inches, and the outer electrode, which has an open structure to allow observation of the space between the two, has a diameter of four inches. These electrodes are mounted inside a glass chamber 40 inches long and 14 inches in diameter which is filled at a pressure of 0.1 pound per square inch with deuterium (D) gas or a deuterium-tritium (D-T) gas mixture. These two electrodes, which are insulated from each other by a pyrex glass collar at their bases and by the gas in the chamber throughout their length, are connected to a 90-microfarad, 20,000-volt condenser bank. The 18,000 joules of electrical energy stored in this condenser bank can produce a current of one million amperes in 2.5 millionths of a second.

When this electrical potential of 20,000 volts is applied to the electrodes, the gas in the space between them becomes ionized and becomes conducting. An atom is said to be ionized when its electrons are stripped away, leaving a positively-charged ion. A completely ionized gas composed of charged nuclei and electrons in rapid, random motion is called a plasma.

Joseph Mather, P-7 group leader, ponders a problem in plasma physics.



This ionization begins at the base of the electrodes and produces a highly conductive annular current sheath which is accelerated to and collapses off the end of the center electrode to be rapidly compressed and heated by a fast z-pinch effect. This forms a high-density D or D-T plasma in which the thermonuclear reactions occur.

The z-pinch is the radial force produced on a conductor (in this case the ionized gas) by the magnetic field which is produced by the movement of current (the accelerating current sheath between the electrodes) in the conductor itself. This force tends to squeeze the conductor toward its axis, the z coordinate in a cylindrical coordinate system.

In addition to the neutrons produced by the thermonuclear reactions, x rays are produced by the deflection of the rapidly moving electrons in the plasma by the electric fields of the positively-charged nuclei. This type of x-ray radiation is called bremstrahlung—a German word meaning braking radiation.

With the dense plasma focus, final plasma densities of about 20 billion billion (2×10^{19}) particles per cubic centimeter and plasma temperatures of about 90 to 140 million degrees Fahrenheit have been obtained. Production rates of 20 billion (2×10^{10}) 2.5-MeV (million electron volt) neutrons per pulse and 200 billion (2×10^{11}) 14-MeV neutrons per pulse have been observed with deuterium and deuterium-tritium mixtures, respectively. These neutrons are all produced in less than a millionth of a second. The total output of x rays, for the deuterium gas, is about 40 joules as measured with an x-ray pinhole camera.

It is expected that the output of the dense plasma focus can be greatly increased by increasing its size and energy input. For exam-

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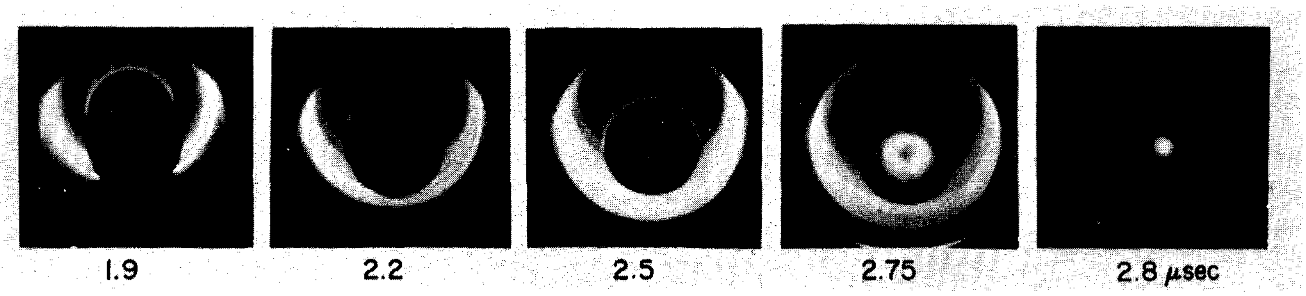

Stages of development of the current sheath and its collapse to the dense plasma focus.

Dense Plasma Focus . . .

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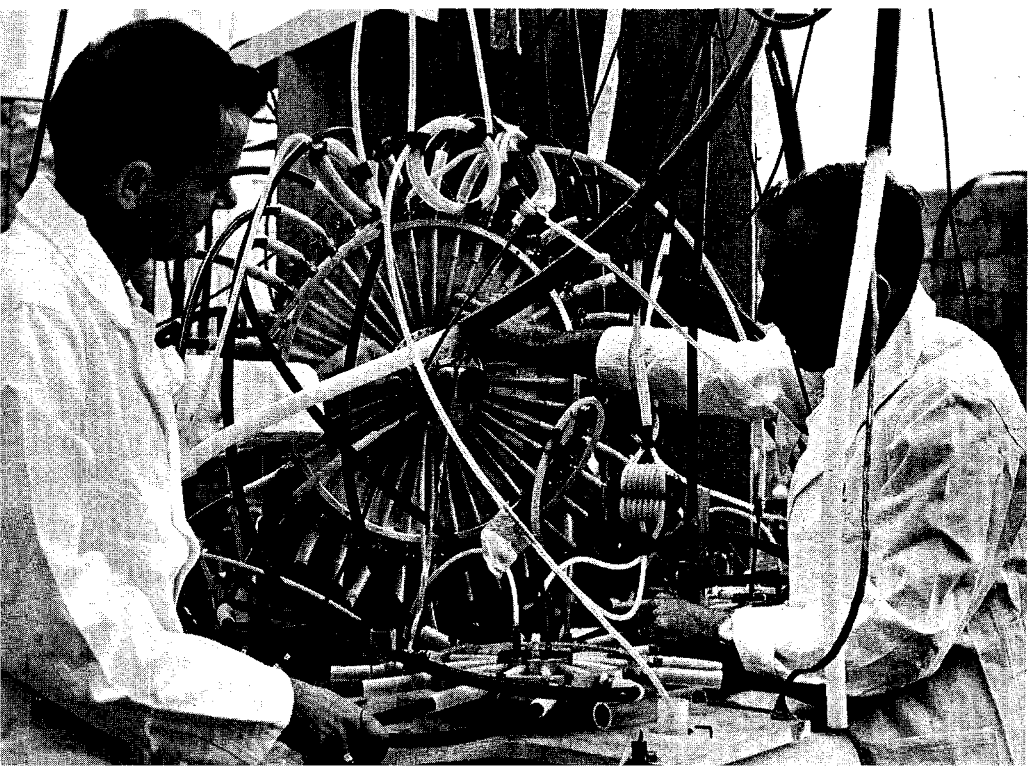
ple, increasing the condenser bank energy to 250,000 joules is expected to increase the maximum neutron production rate 10 times for the deuterium gas and 100 times for the deuterium-tritium gas mixture.

The dense plasma focus naturally cannot compete with reactors and accelerators as a continuous neutron source, but as a pulsed source and in terms of the rate of neutron production, it surpasses any device except a nuclear explosive. It therefore has great potential as a pulsed neutron and x ray source for a large number of applications in research and industry, such as pulsed neutron studies of nuclear reactor fuel, flash x-ray photography and neutron activation analysis of short-lived radioelements. In addition to the Los Alamos work on the dense plasma focus, this device is concurrently under study by H. Fillipov in the U.S.S.R. and in several industrial laboratories in this country.

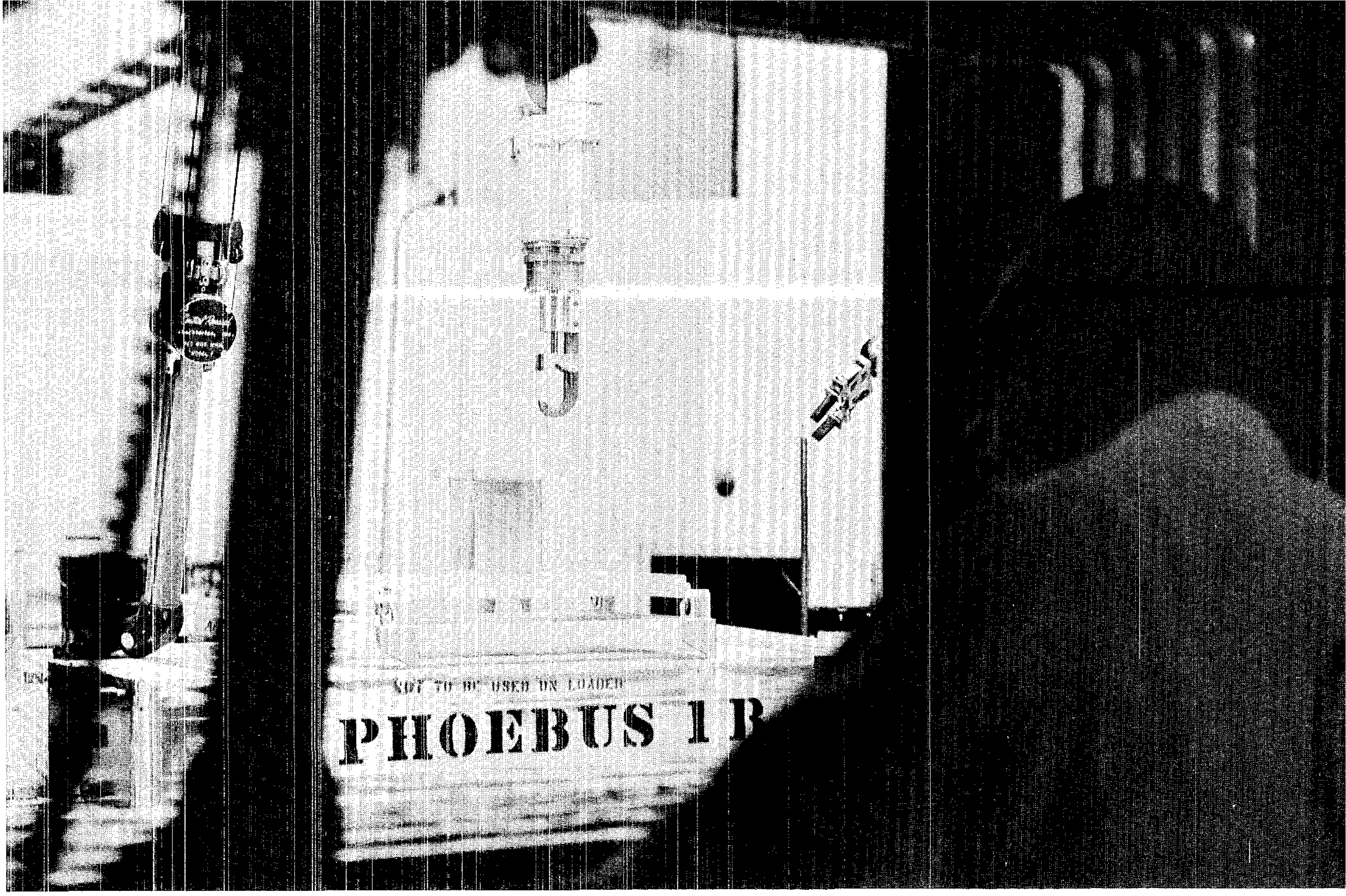
In addition to the obvious advantage of low cost, the compactness and relative simplicity of the dense plasma focus also enhance its usefulness, and its impressive merits have, in fact, already resulted in its being put to use. Mather reports that a manufacturer of small accelerator neutron sources has built a dense plasma focus and is offering it for sale.

The Los Alamos pulsed neutron research group, N-6, headed by Robert Keepin, is planning to construct a dense plasma focus in fiscal year 1968. It would be used in the group's program of studying delayed fission neutrons from fission induced by high-energy neutrons. This study will provide basic data important in fast breeder reactor design and in the development of new delayed neutron response techniques for the detection, identification and analysis of fissionable isotopes.

Thus, it is likely that the dense plasma focus will become an important new tool for the nuclear scientist and engineer.



Paul Bottoms, left, and Glen Livermore tighten the collar holding the center electrode of one of the dense plasma focus devices. The circular array of leads connects the outer electrode to the three sets of condensers, one of which is seen between the two men.



A technician in operating gallery maneuvers items in upper disassembly bay with an assortment of remote control manipulators. Window in front of him is lead glass five feet thick to provide protection from radiation.

Disassembly: Post Mortem On A Reactor

The end of a full power nuclear reactor test marks just the beginning of another phase of the Los Alamos Scientific Laboratory's key role in Project Rover. This is disassembly, when the reactor is taken apart, piece by piece, and carefully analyzed to see how it fared.

After a full power test, the center of activity at the Nuclear Rocket Development Station in Nevada shifts from the control point and the test pad to the R-MAD building—Reactor Maintenance, Assembly and Disassembly. Here the "post mortem" is conducted, and data on nearly every inch of the reactor and its components are collected and recorded for future use.

One reason scientists carefully study the reactor after the test is to see what kind of damage occurs to the fuel elements so they can make improvements in the design and elements of future reactors. But N

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Disassembly . . .

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division scientists—LASL's "Rover boys"—consider a full power test not simply a proof of design but a part of their overall program to develop a nuclear reactor that can be used in space travel.

Research on all phases of the project goes on continuously, and each full power test is really an experiment to confirm this research. The results of the test then serve as a guide to subsequent reactor research, as well as providing information for improving later reactors. As an example, scientists have improved reactor fuel elements by a factor of ten since the beginning of the Rover program, according to Donald P. MacMillan, N-1 group leader.

"We don't just build a reactor to see if it works," he explained. "We know by now it will work. So now we incorporate a great many experiments in the core, and during the post mortem we study these very carefully. We also look very closely at such things as core temperatures and fission distribution. Now that we know how to design this kind of reactor, the post mortem becomes more and more important in helping us make improvements."

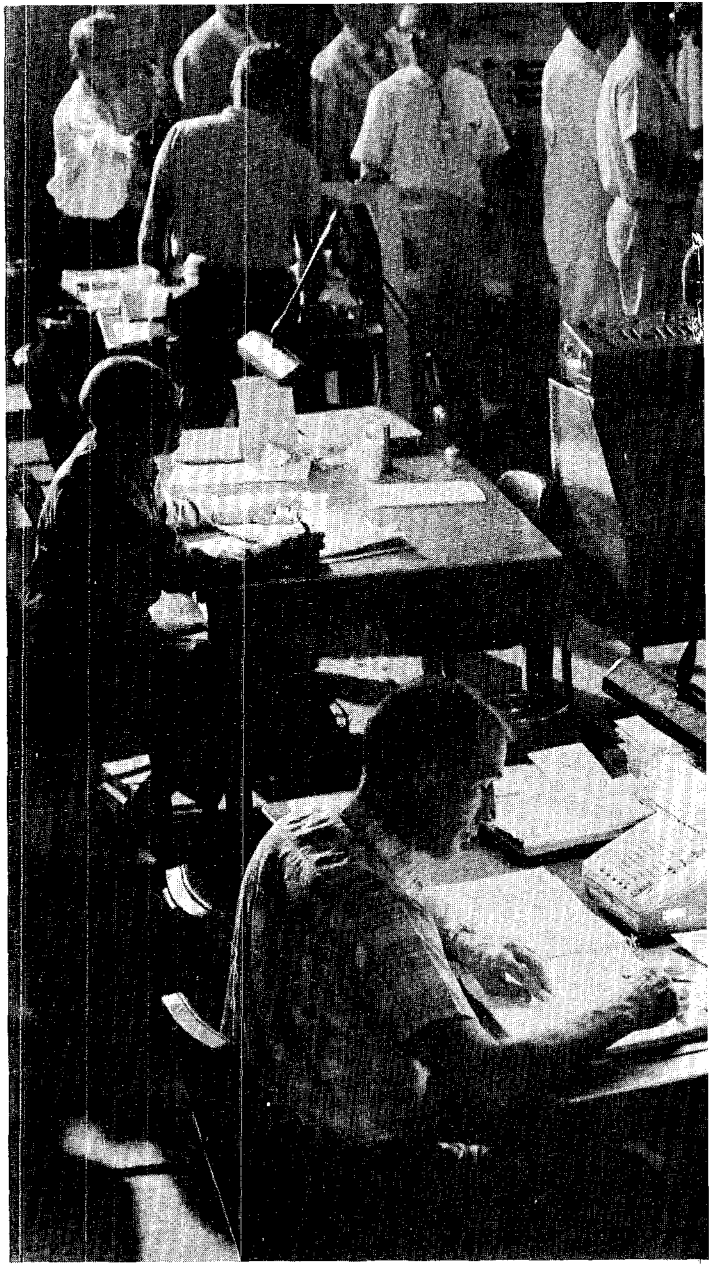
During the Phoebus 1B disassembly, completed in April following the Feb. 23 full power run, each fuel element was photographed several times, weighed, measured for gamma spectrum and otherwise analyzed. This information was recorded on computer cards, and the nearly 9,000 photographs—on long rolls of positive transparencies—were available to scientists almost immediately for detailed studies of the appearance of the elements. More than 150,000 "words" of digital information—averaging seven digits in length—were gathered in the 1B disassembly alone.

But it was not always this way.

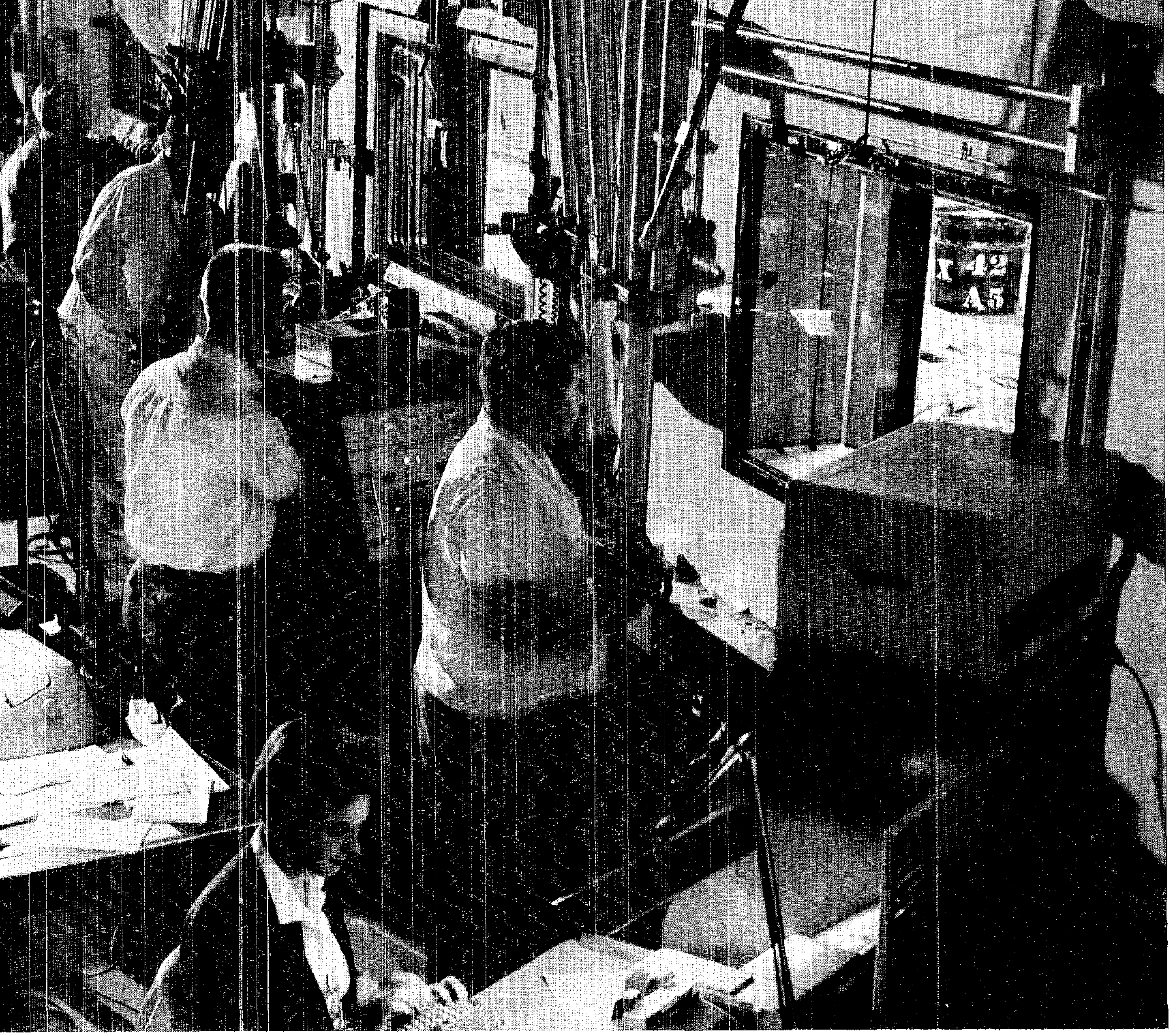
Just as with the design of the reactors, disassembly, too, has gained a new sophistication. Project Rover—the nation's program to develop a nuclear rocket for use in space exploration—began in 1955, and, true to LASL tradition, Laboratory scientists accomplished something that had never been done before. It has been less than eight years since LASL scientists tested the world's first nuclear rocket reactor— Kiwa A. As N Division Leader Roderick W. Spence once commented, "This reactor was, so to speak, pre-Model T . . . But at the time, Kiwi A was challenge enough."

But with each succeeding reactor test and disassembly, LASL scientists have made such substantial improvements that the next LASL reactor, Phoebus 2A, scheduled for testing later this year, is the type expected to be the basis for the nuclear rocket engine for actual space missions.

Post mortem examinations of the early Kiwis were geared mainly to providing basic information that would help in improving the design of the reactor, and they were slow and relatively inefficient opera-



Operating gallery overlooking upper disassembly bay is crowded during a disassembly. Men at tables serve as "recorders," keeping track of elements and information about them as technicians operate manipulators to move the elements through the ASP system. In foreground, data about elements are recorded on computer cards. It's a standing rule that no one does any unnecessary talking, since operators constantly call out long series of numbers and other information to be recorded.



tions compared with the recently completed Phoebus 1B disassembly.

In the "early days"—as little as two years ago—one step in the disassembly took as long as 15 minutes per fuel element—with scientists scanning the elements through the windows or through periscopes and calling out inspection data for a "recorder" to jot down on a sheet of paper. The information about the condition of each element was based on the observer's immediate appraisal of the situation—and was affected by such factors as the individual observer's opinion and his angle of view.

After photographers took pictures of the fuel elements and other reactor components through periscopes, the elements were placed in storage where retrieval was difficult in the event scientists wanted to recheck the information later on.

In contrast, Phoebus 1B disassembly took only about half as long as previous disassemblies and provided five or six times as much diagnostic data as had been obtainable before. Two major photographic data systems, along with the associated fuel element handling systems—all designed by LASL personnel—provided much of the improved data, in both quantity and quality, that Project Rover scientists are now finding so useful. Where previously a notation of someone's observation of the fuel elements had to suffice, now there are complete sets of photographs that can be studied in detail for as long as necessary.

The disassembly data gathering systems, a cooperative effort of N-1, D-8 and J-9, were designed by Donald Rose, N-1, with cameras and photographic

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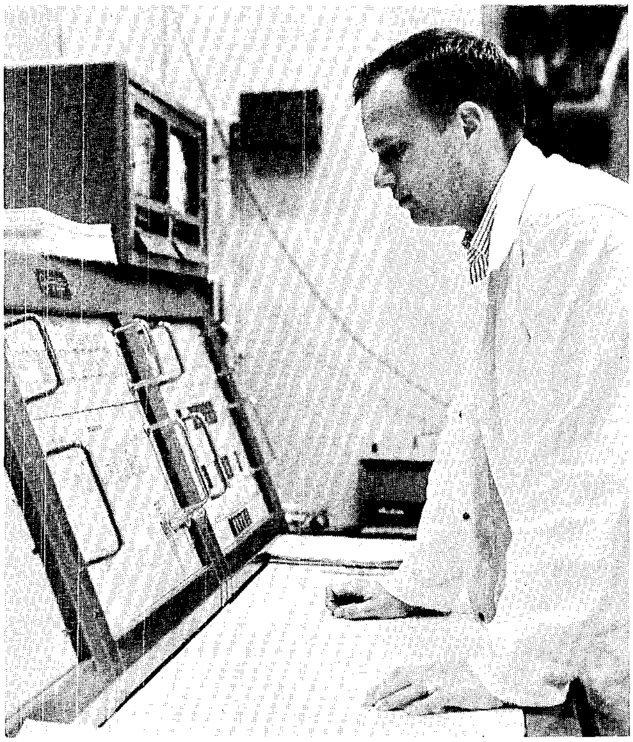

ABOVE, Steve Gardner, EG&G technician, checks ASP controller which controls sequence of events in the system, including conveyor advance, camera shutter, vacuum that holds film flat in magazine, film advance and other phases of system. LEFT, Avery Bond, J-9 group leader, left, confers with Gerald Armstrong and Del Carter, both J-9, at entrance to operating gallery of lower disassembly bay.

Disassembly . . .

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systems designed by Robert PerLee, D-8. Element handling equipment and fixtures were designed and fabricated by J-9 personnel, under the supervision of Avery Bond, J-9 group leader at NRDS. The new systems—both those used for Phoebus 1B and those planned for 2A—are designed for efficient data retrieval as well as for providing a maximum of information about the condition of the reactor after a test.

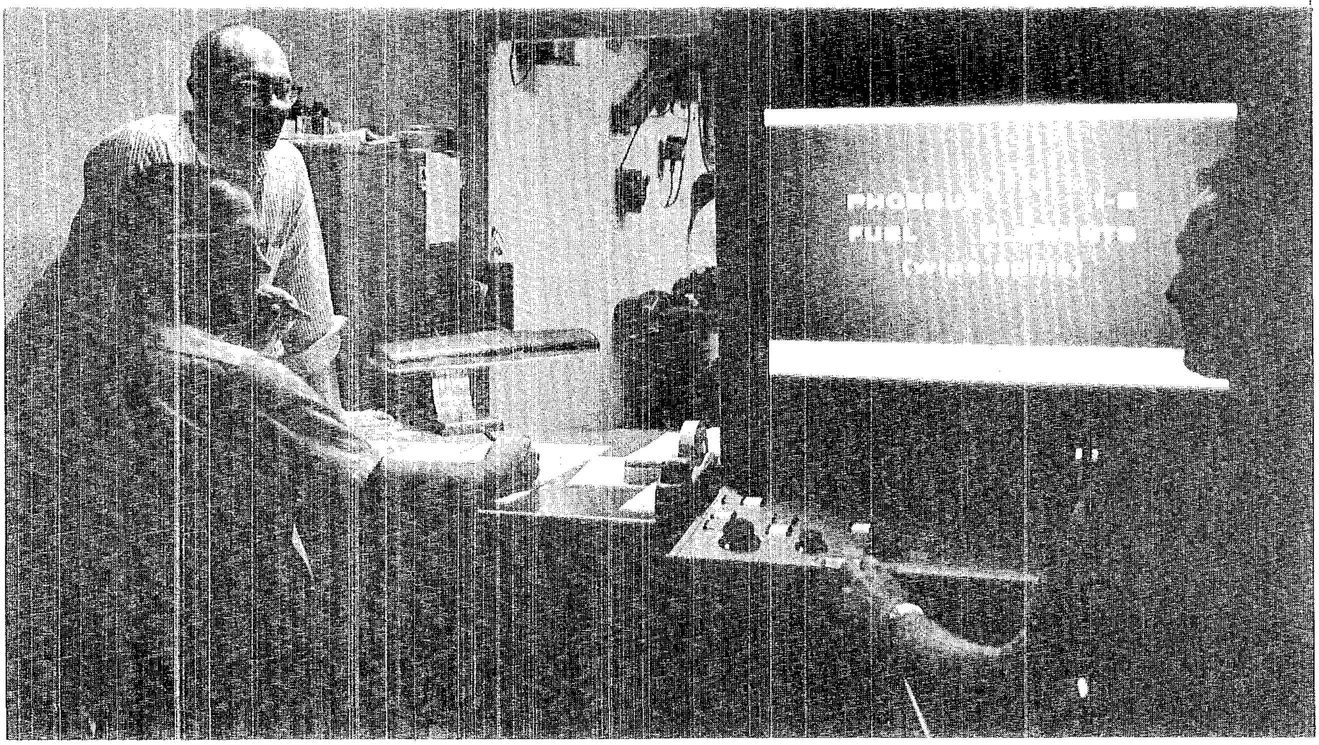
Rose explained that the photographic systems have been incorporated into the major fuel element data systems so the cameras can be operated automatically by the technicians who run the manipulators. All but about 50 of the nearly 9,000 photographs of the 1B disassembly were made with the same type of film so that the same type of processing and viewing equipment can be used—resulting in not only a saving in cost but also a faster, more accurate and more efficient method of studying the condition of the elements.

"The new photographic systems are a real breakthrough. We are learning more than ever before about reactors because never before have we been able to study the fuel elements in such infinite detail," said MacMillan.

Design of the cameras and photographic systems was a considerable challenge because of the requirements of the heavily shielded MAD building and the problems posed by taking pictures in a radioactive area. No commercially available equipment met these requirements, so PerLee designed each of the five cameras for its specific use and its location in the MAD building, as well as for its use in the total disassembly data system.

A tour through the MAD building during disassembly shows the new systems in use in the overall dissassembly operation.

Dissassembly begins a few days after the full power test, when the reactor, still on its special railroad car, is disconnected from the test cell and pulled by a remotely-controlled engine some two miles across Jackass Flats to the R-MAD building. Tracks of the "Jackass and Western" lead directly into the lower disassembly bay of the MAD building. With the



ABOVE, Leo Cowder, N-1, Stu Apgar, N-2, and Lyle Wahman, N-1, prepare to look at photos taken in hot cells of slit pieces of fuel elements. Identification leader for 100-foot roll of positive transparencies shows on film reader. RIGHT, Jack Doren, J-9, standing, and Robert PerLee, D-8 associate group leader, set up ASP camera installed in shielding wall of upper disassembly bay.

reactor and test car inside, the six-foot-thick, 400-ton door is closed behind it.

In the lower disassembly bay—a huge room with a 60-foot ceiling—a large overhead crane lifts the reactor off the test car and places it in a supporting stand. Then the nozzle and upper part of the pressure vessel are removed from the reactor.

The crane then lifts the core out of the "dome" of the reactor and, moving along an overhead track, takes it to the upper dissassembly bay, which adjoins the lower bay at the second story level. It is in the upper bay where the crucial diagnostic work in a disassembly begins.

Here, with the help of "O-Man"—a large overhead manipulator used to operate power tools by remote control—more instrumentation is removed, and actual disassembly of the core begins.

Overlooking the upper disassembly bay are four five-foot-thick lead glass windows, each equipped

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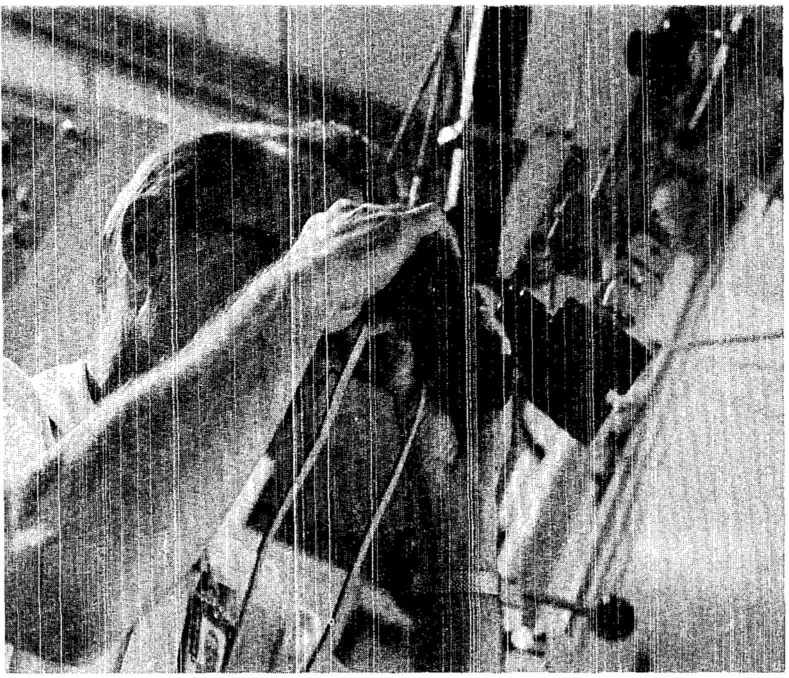
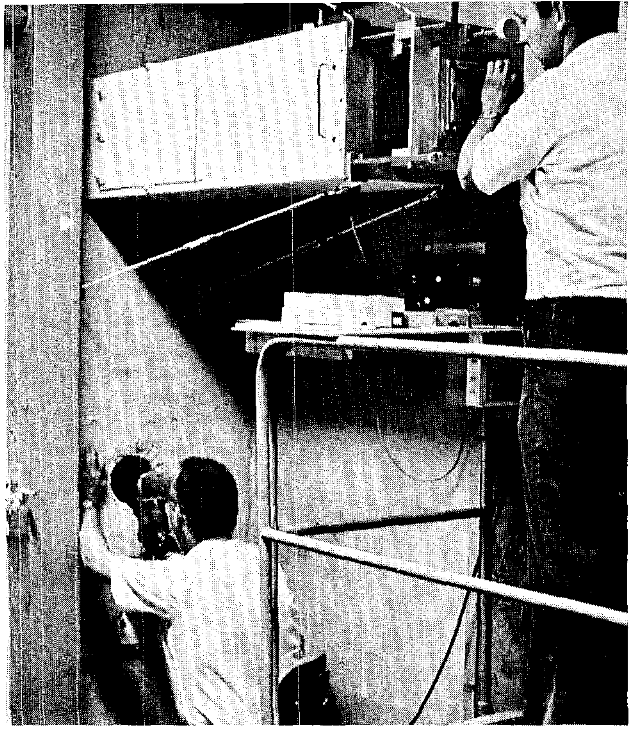


Roy Petty, N-1, uses binoculars to inspect part of reactor through a window in the disassembly bay.



"INSIPID" is both a camera and a visual inspection device. PerLee, left, looks through viewing port as Doren prepares to take picture. Mirror on other side of wall pivots so system can be used for both purposes.

Disassembly . . .

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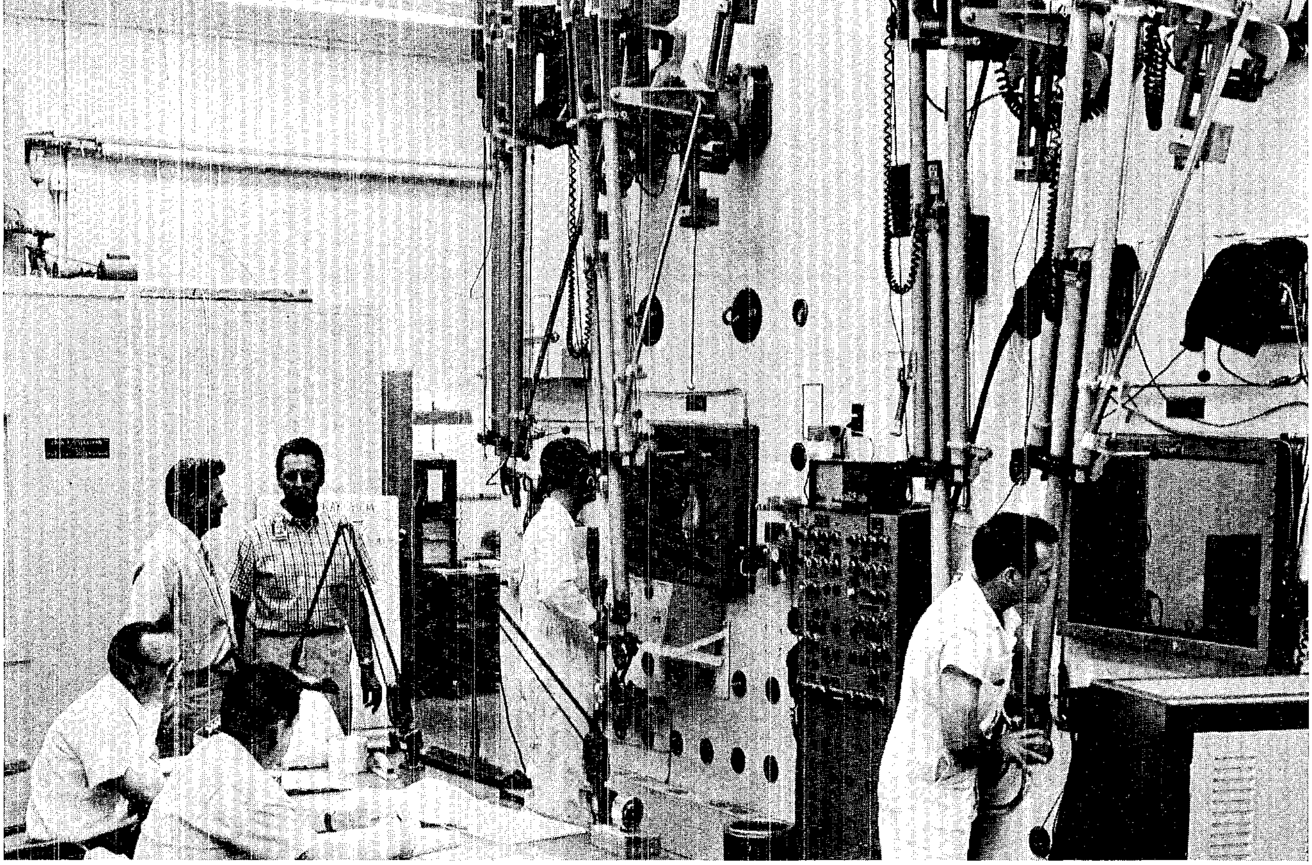
with two "master-slave" manipulators which function much the same as human arms—with "shoulders", "elbows", "wrists" and "hands". Technicians skilled in the exacting job of operating these mechanical arms work at each window, guiding the manipulators in taking the reactor apart. Portions of the core are sent by conveyor from one window to the next, assembly-line fashion.

At the first window, the manipulator operators—using the mechanical arms to operate remote control saws and other tools—remove more parts of the reactor. Then they place the core in position to be disassembled.

The first camera—"INSIPID": in situ photo inspection device—while not a part of the automated systems, is unique in its design. Although it is located only 15 feet from the core—just outside the heavy concrete shielding wall—there is an optical distance of 90 feet from the core to the film. The camera is installed in the shielding wall, pointed 90 degrees away from the core with the lens end shielded by a second wall to protect operators from radiation. Through a series of special mirrors on the walls and ceiling of the upper disassembly bay, the image of the core is directed the 90 feet into the camera. The resulting pictures are of a quality seldom found in even the best photographs taken under more ordinary circumstances.

After being photographed by INSIPID, elements are removed from the core and placed on the conveyor system as the beginning step in the first of the automated disassembly data systems—ASP: automated system of photography. In addition to the camera and related photographic equipment, ASP includes fuel element loaders and unloaders, a balance for weighing the elements, the associated data handling system—including computer punch cards and readout—and the automatic sequencer which operates the photographic equipment on command from the manipulator operator.

When the operator has the fuel elements in the proper location—and the automatic sequencer verifies it—he pushes a button on the control panel. This automatically trips the shutter, flashes the photo lights and records a frame number on the film, then advances the film and frame number, ready for the next photograph—and verifies that all this has occurred. Each element is turned automatically, and the process is repeated until the entire surface of each element has been photographed. This operation is repeated with each tray of elements.



Special studies are conducted in hot cells. NERVA technician Larry Jones, at left window, saws elements in pieces and moves them to window at right where Lee Vikdal weighs, measures and photographs them. Camera sequencer is in console at right, and cameras are installed just above window. Standing, Henry Filip, N-1, confers with John O'Sullivan, hot cell supervisor, as Jack Conant, WANL, and John Moore, J-3, record data.

As the elements move from one window to the next, information about each one—such as weight and other diagnostic data, along with bookkeeping data such as the ultimate disposition of the element—is punched into computer cards.

At the fourth window in the upper bay, the elements are placed in "cask inserts"—shipping and storage containers—according to their destinations. The "most normal" elements are sent to the radioactive storage area. Others are returned to Los Alamos for detailed study by CMB-14, and still others are singled out for additional scrutiny in the "hot cells" in the lower level of the MAD building, where special equipment is used to study and photograph elements of particular interest.

In the Phoebus 1B disassembly, all elements made one stop in the hot cell area, regardless of their ultimate destination, to undergo a two-peak gamma count, which provides a "map" of fission distribution in the core. For the 2A disassembly, this operation will be a part of ASP.

After the two-peak gamma count, the elements destined for storage or return to Los Alamos are replaced in the cask inserts and placed in lead storage or shipping casks. Those to be studied further at the

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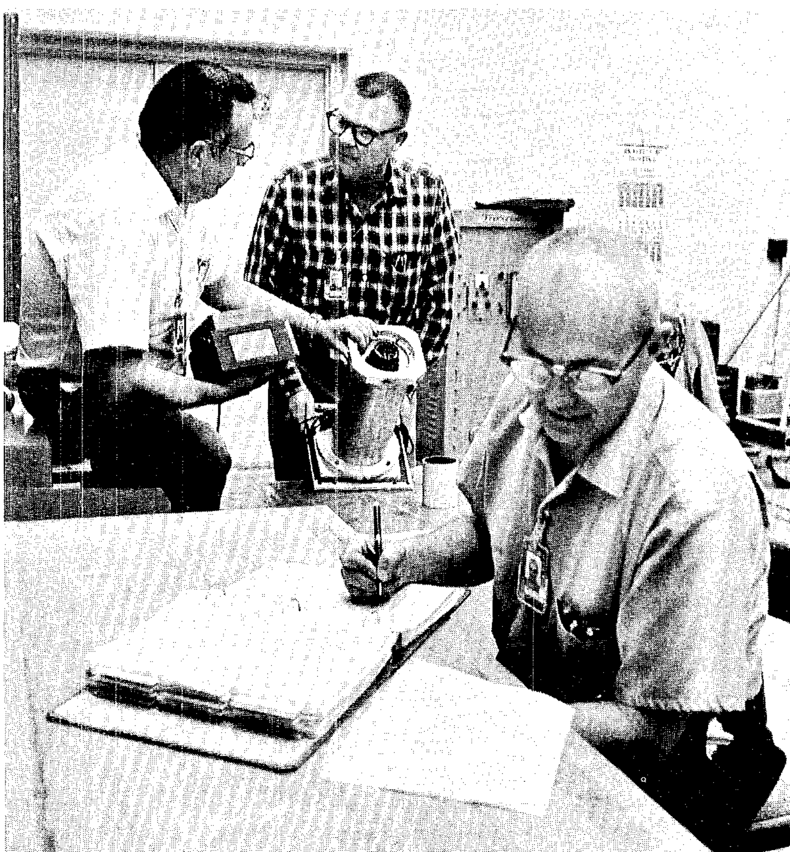
PerLee and Donald Rose, N-1, check one of the cameras used in hot cell operations as Dick Davis, J-9, goes over element location lists.



Disassembly . . .

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MAD building go to one or more of the hot cells—small, heavily shielded rooms which are also equipped with master-slave manipulators to operate special equipment.

Two of the hot cells are part of the second major data system. More than 7,000 of the 9,000 Phoebus 1B post mortem photographs were taken here with three separate camera systems PerLee designed for specific uses in the hot cell operation.

Elements for this special study go into one hot cell where the manipulator operator carefully paints identification markings on them. Then, using a power saw, he cuts the elements into pieces, places them in a tray and moves them to the adjoining hot cell. Here an operator weighs and measures the pieces and then positions them for photographs. Again the photos are taken automatically by pushing a button on an automatic sequencer which operates the camera, photo lights and photo identification numbering system.

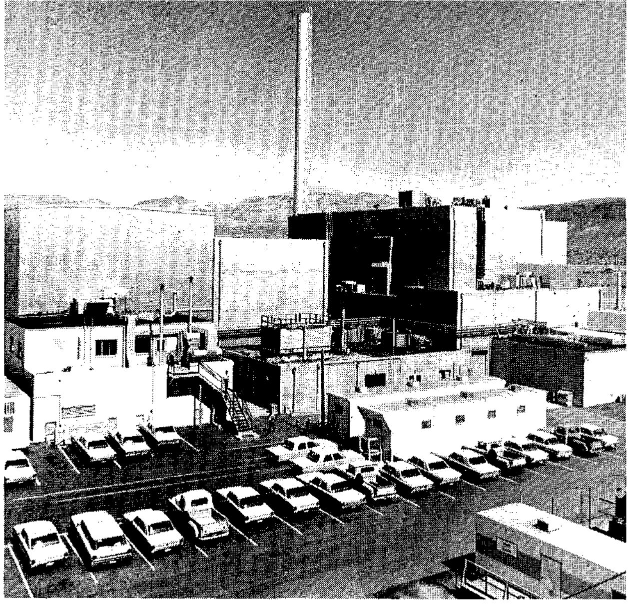
The fuel element pieces are then sawed in half lengthwise, and another camera photographs the split pieces. The third camera in this hot cell is used in another operation to photograph the support blocks that hold the elements in place in the reactor. A series of strategically located mirrors makes it possible to show the support blocks from five different angles in one photograph. In addition to the photographs, which show as much detail in the elements as a microscope would, data on each element are recorded continuously throughout these operations.

All the automated photographic systems for disassembly use high resolution 70 millimeter film in 100-foot rolls. These are developed, then printed as positive transparencies and are ready for scientists to view within a few hours. Very stringent quality standards are maintained throughout. The printer used to make the positive transparencies is only the seventh of its kind in use in this country. (The first four were built for making prints of the movie, "Cleopatra.")

The rolls of positive transparencies are viewed in a custom-built rear projection film reader where scientists can compare and study details in the fuel elements at approximately three quarters actual size, at actual size or magnified three times.

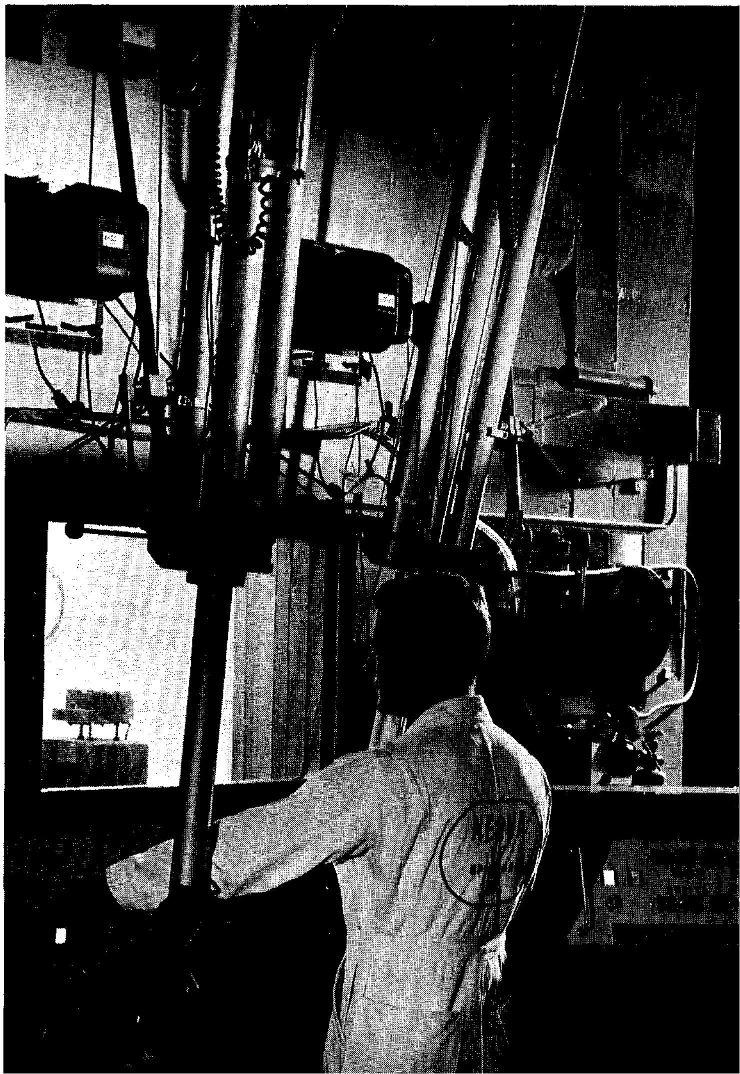
Nearly 175 people were involved in the MAD building operations of the Phoebus 1B disassembly and post mortem—ranging from radiation safety monitors and manipulator operators to LASL scientists who designed and built the reactor. Now that the disassembly itself has been completed, scientists continue their extensive study of the almost endless amount of data they gathered.

And when man one day reaches the planets, the probability is strong that LASL research will have been instrumental in getting him there.

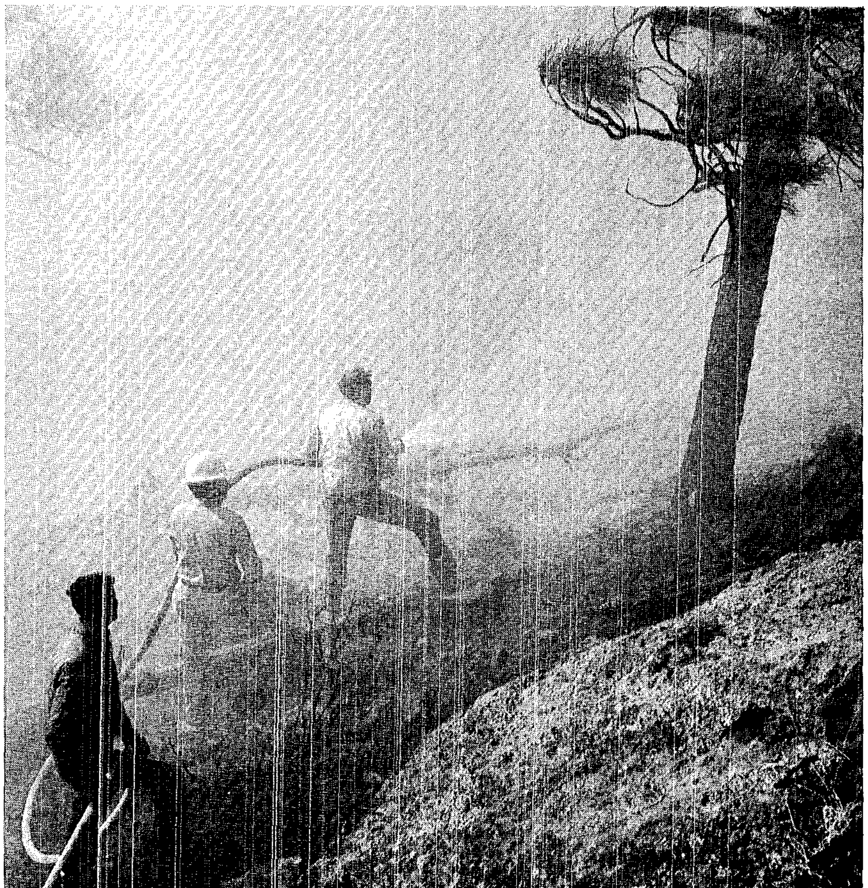


R-MAD building includes a large assembly bay at left, a clean room which is used for assembly operations and, at right of stack, the disassembly bays. Four of the seven hot cells show at far right of photo. A. R. Driesner, N-1, and C. D. Montgomery, formerly of LASL, provided the basic design for the building.

Lee Vikdal operates manipulators in hot cell where pieces of elements are weighed, measured and photographed.

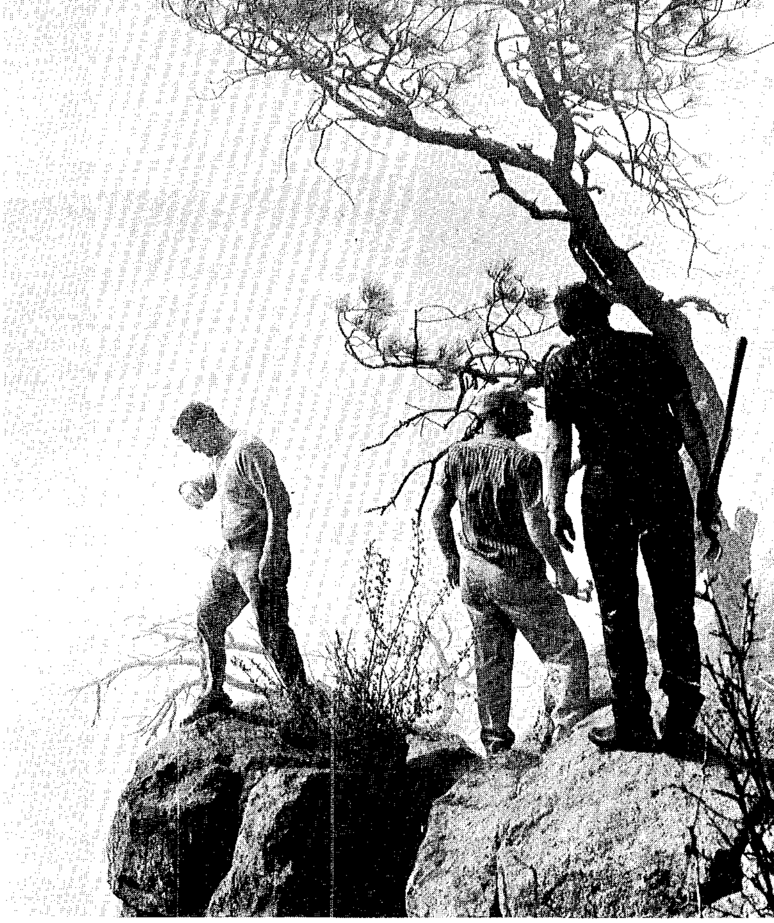


Forest Fire Threatens Barranca Homes



Los Alamos firemen and Barranca Mesa residents joined forces to stop a forest fire that threatened to destroy several Barranca homes last month. The fire, which apparently started near Guaje Pines cemetery, burned out about 10 acres of forest land in Guaje canyon before it could be contained.

As the wind swept the fire down the canyon, residents responded with shovels, chain saws and garden hoses. As one resident said, "I think every garden hose on the Mesa was being used." Fire hoses and garden hoses were threaded from every available hydrant and nearby house, and many of the residents who weren't in the canyon fighting the fire were watering down the houses at the edge of the canyon. Their efforts weren't in vain; there



Guaje Canyon fire destroys 10 acres before firemen, residents can contain it . . .

were no reports of damage to any of the homes.

Firemen and residents were strong in their praise of each other. One resident commented, "Those firemen really know how to handle a fire like that." And AEC Fire Chief Lowell Denny said, "I don't know what we would have done without those people; they really pitched in and helped."

The fire on May 6 followed the driest first four months ever recorded on the Hill—with less than an inch of precipitation for the entire year to that date. The dry spell was broken the last few days in May, although only .73 inch was recorded at the LASL weather station for the month—making it the second driest five months, only .16 inch more than the record, which was set in 1933.

The Technical Side

Presentation at QAD Computer Seminar Workshop, Reactor Shielding Information Center, Oak Ridge, Tenn., April 17-19:

"QAD Computer Code" by R. E. Malenfant, D. M. Peterson and J. R. Streetman, all N-2.

Presentation at Colloquium at High Altitude Observatory, Boulder, Colo., April 20:

"The Motion of an Artificially Produced Plasma in the Earth's Magnetic Field" by John Zinn, J-10.

Presentation to the International Atomic Energy Agency Panel on Delayed Fission Neutrons, Vienna, Austria, April 24-26:

"Delayed Fission Neutron Data in Reactor Physics and Design" by G. R. Keepin, N-6. (Invited paper)

Presentation at American Physical Society Meeting, Washington, D.C., April 24-27:

"Violation of Isobaric Spin in $^{208}Pb(p,d)$ ^{207}Pb" by D. D. Armstrong, P-12, and E. M. Bernstein, T-DOT.

"Energy Levels of Sc^{42}, V^{46}, Mn^{50} and Co^{54}" by Rubby Sherr and J. A. Nolen, Jr., both Princeton University, A. G. Blair and D. D. Armstrong, both P-12.

Presentation at Joint Colloquium, University of Virginia and National Radio Astronomy Observatory, Charlottesville, Va., April 27:

"Quasi-Stellar Objects" by James Terrell, P-DOR.

Presentation at Seminar, Air Force Office of Scientific Research, Arlington, Va., April 28:

"Thermal Decomposition of Ozone in Shock Tube" by W. M. Jones, CMF-4.

Presentation at Symposium on Biological Properties of the Mammalian Surface Membrane, Wistar Institute of Anatomy and Biology, Philadelphia, Pa., April 28:

"Isolation of Acid-Soluble Polysaccharide from Cultured Cells" by P. M. Kraemer, H-4. (Invited paper)

Presentation at Trinity Section of the American Nuclear Society, Los Alamos Meeting, April 28:

"Engineering Aspects of the Los Alamos Meson Physics Facility" by F. R. Tesche, MP-5.

American Ceramic Society's 69th Annual Meeting, New York, N.Y., April 29-May 4:

"Thermodynamics of Non-Stoichiometric Zirconium Carbide" by G. L. DePoorter, CMB-3.

"Thorium-Thorium Dioxide Phase Equilibria" by Robert Bentz, CMB-3.

"Ferroelectric Studies on the Systems Pb $[(Sc_xFe_{1-x})_{0.5}\psi_{0.5}]O_3$, where ψ = Nb or Ta" by V. J. Johnson and M. W. Valenta, both W-3; R. E. Cowan, CMB-6; R. M. Douglass, CMB-1; and J. E. Dougherty, W-3.

"Ferroelectric Studies on the Systems Pb $[(Sc_{0.5}\psi_{0.5})_x\phi_{1-x}]O_3$, where ψ = Nb or Ta and ϕ = Ti, Zr, Hf, or Sn" by M. W. Valenta and V. J. Johnson, W-3; R. E. Cowan, CMB-6; R. M. Douglass, CMB-1; and J. E. Dougherty, W-3.

Presentation at Seminar, Department of Biology, Washington University, St. Louis, Mo., May 1:

"Biochemical Genetics of Neutrospora Malata Dehydrogenase and Mitochondrial Structural Protein" by K. D. Munkres, H-4. (Invited talk)

Presentation at American Association for Advancement of Science Meeting, Tucson, Ariz., May 1:

"Liquid Scintillators. The Synthesis and Properties of Some Dibenzo- and Dinaptho-dioxepins, dioxocins, dioxonins, and Dioxecines" by J. E. Simpson and G. H. Daub, University of New Mexico, F. N. Hayes, H-4, and J. Yguerabide, Sandia Corporation.

Presentation at Colloquium at Chalk River Nuclear Laboratories, Chalk River, Ontario, May 1:

"Studies of Transition States from (d, pf) and (t, pf) Angular Correlation Measurements" by H. C. Britt, P-DOR.

Presentation at Colloquium on Dislocation Dynamics, Batelle Memorial Institute, Seattle, Wash., and Harrison, B.C., May 1-5:

"Stress Wave Profiles in Several Metals" by J. W. Taylor, GMX-6. (Invited paper)

Presentations at Physics Department of Tulane University, New Orleans, La., May 1, and Lamar State College of Technology, Beaumont, Texas, May 2:

"Lattice Vibrations of Li^7D" by J. L. Verble, P-2. (Invited talks)

Presentation at American Industrial Hygiene Association Meeting, Chicago, Ill., May 1-5:

"Nuclear Criticality Safety as an Integral Part of Materials Processing" by D. R. Smith, N-2.

"Respiratory Protective Devices" by E. C. Hyatt, H-5. (Invited paper)

International Conference on Research Reactor Utilization and Reactor Mathematics, Mathematics and Computation Division of the American Nuclear Society and Reactor Group of the Mexico Nuclear Center, Mexico City, Mexico, May 2-4:

"DTFBUR, An Interative One-Dimensional Multigroup Transport Theory Burnup Program" by J. J. Prabulos, Jr., formerly LASL.

"Numerical Investigation of the Stability of Reactors with Xenon-135" by G. M. Sandquist, K-3 Consultant, University of Utah.

"Computers: Past, Present and Future" by W. J. Worlton, CADP. (Invited paper)

Sixth Rare Earth Research Conference, Gatlinburg, Tenn., May 3-6:

"A Study of Some Geometrical and Mechanical Effects on the Extraction of Europium by Lithium Amalgam from Aqueous Lithium Citrate Electrolytes" by J. B. Goddard, Northwestern University, J. M. Campbell, University of Alberta, and E. I. Onstott, CMB-8.

"The Preparation of Thorium Dicarbonate, Uranyl Carbonate and Some of the Rare Earth Carbonates from Anhydrous Acetate Salts" by E. L. Head, CMF-2.

"Self-Irradiation Effects in a Cerium Alloy Containing 15 a/o Plutonium" by R. O. Elliott, W. N. Miner and F. W. Clinard, Jr., all CMF-5.

"High-Temperature Neutron Diffraction Study of LaC_2 and YC_2" by A. L. Bowman, N. H. Krikorian, both CMB-3; G. P. Arnold, P-2; T. C. Wallace, CMB-3; and N. G. Nereson, P-2.

"The Energy Levels of Tetravalent Dysprosium. Fluorescence and Absorption Spectra of Cesium Dysprosium(IV) Heptafluoride" by L. P. Vargo, Oklahoma State University, and L. B. Asprey, CMF-4.

Presentation at Colloquium, Bettis Atomic Power Laboratory, Pittsburgh, Pa., May 4:

"Cross Section Experiments Using Nuclear Explosives" by B. C. Diven, P-3.

Presentation at Public Conference on Body Composition, University of Missouri, Columbia, Mo., May 4-6:

"Organic Scintillation Detectors and Their Use in the Study of Body Composition" by E. C. Anderson, H-4. (Invited talk)

Presentation at Seminar in Department of Biochemistry, School of Medicine, University of Louisville, Louisville, Ky., May 5:

"The Development of Competence (Transformability) in Bacteria" by B. J. Barnhart, H-4. (Invited talk)

Presentations at Seminar, Puerto Rico Nuclear Center, Puerto Rico, May 2-5, and at University of West Indies, Kingston, Jamaica, May 8:

"The Crystal Structure of $K_3Cu(CN)_4$" by R. B. Roof, Jr., A. C. Larson and D. T. Cromer, all CMF-5. (Both invited)

Presentation at Sandia Base, May Mechanical Seminar of Plant Engineers, Albuquerque, N.M., May 4:

"Common Cryogenic Gases—Their Use, Cost, Storage and Distribution" by J. H. Fretwell, CMF-9. (Invited talk)

Presentation at Symposium on Carbide Composites at the Electrochemical Society, Dallas, Texas, May 7-12:

"Carbide-Graphite Composites" by K. V. Davidson, R. E. Riley and J. M. Taub, all CMB-6. (Invited paper)

"Characterization of Commercial Carbide Powders" by R. E. Riley, CMB-6. (Invited paper)

Presentations at Libby-Cockcroft Meeting, Argonne National Laboratory, Chicago, Ill., May 8-9:

"$\gamma\alpha$ Transformations in Cerium-Rich Alloys Containing Plutonium" by R. O. Elliott and F. W. Clinard, Jr., both CMF-5.

"The Low-Temperature Electrical Behaviors of As-Cast and Chill-Cast High-Purity Alpha Plutonium" by R. O. Elliott and W. N. Miner, both CMF-5.

"Annealing of Self-Irradiation Induced Defects in Alpha Plutonium Stored at 87°K" by W. N. Miner and R. O. Elliott, both CMF-5.

"Transport Properties of α-Pu and Some Pu Alloys" by J. F. Andrew, CMF-5.

Presentations at International Symposium on High Temperature Chemistry, Argonne National Laboratory, Lamont, Ill., May 8-10:

"Correlation of the Activity Gradient with the Diffusion Coefficient of Carbon in the Nb-C System" by T. C. Wallace, CMB-3. (Invited paper)

"An Evaluation of the Heat of Vaporization of Uranium from the Behavior of the U-C System" by E. K. Storms, CMB-3. (Invited paper)

"Some of the Thermodynamic Implications of Random Carbon Defects in NbC_x" by E. K. Storms, CMB-3. (Invited paper)

"Thermodynamics of the Plutonium Carbides" by W. M. Olson and R. N. R. Mulford, both CMF-5.

Presentation to Panel of the International Atomic Energy Agency on Nuclear Standards Needed for Neutron Cross Section Measurements, Brussels, Belgium, May 8-12:

"The $^1H(n,n)$ Cross Section as a Nuclear Standard" by J. C. Hopkins, P-DOR. (Invited talk)

Institute of Electrical and Electronic Engineers, Region Six Annual Conference, Albuquerque, N.M., May 9-11:

"Nuclear Rockets: The Rover-Phoebus Program" by R. W. Spence, N-DO. (Invited paper)

"Explosive Electromagnetic Power Generators" by C. M. Fowler, GMX-6. (Invited paper)

"Progress Report on Sherwood" by J. L. Tuck, P-DO. (Invited paper)

"Nuclear Reactor Development" by D. B. Hall, K-DO. (Invited paper)

Presentation at Symposium on Solid and Fluid Mechanics, University of Michigan, Ann Arbor, Mich., May 10-12:

"Los Alamos Rover Program—Nuclear Rocket Propulsion" by J. C. Rowley, N-7. (Invited paper)

Presentation at 21st AEC Metallographic Group Meeting, Brookhaven National Laboratory, Upton, N.Y., May 10-12:

"Metallography of Hypo-, Hyper- and Stoichiometric Sintered (U, Pu)C" by J. H. Bender, Jr., K-2.

"Metallography of Pyrolytic Carbon- and/or Tungsten-Coated Uranium Oxide and Uranium Carbide Fuel Spheres" by J. H. Bender, Jr., K-2.

"Metallographic Preparation Techniques for Multiple Metal Carbide Coatings" by J. H. Bender, Jr., K-2. (Classified paper)

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the technical side . . .

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Colloquium at Pennsylvania State University, University Park, Pa., May 11:

"Interatomic Forces in Molecules from Vibrational Spectra; Application to Nitrosyl Fluoride' by L. H. Jones, CMF-4. (Invited talk)

Presentation at New Mexico State University, Las Cruces, N.M., May 11:

"An Experiment in Multiply-Connected Superfluids" by P. T. Sikora, T-9.

Presentation at Southwest Regional Meeting of the Association for Computing Machinery, El Paso, Texas, May 11-12:

"Computer Movies from Numerical Fluid Dynamics Calculations" by J. P. Shannon, T-3. (Invited talk)

Presentations at University of New Mexico for Dedication of New Graduate Residence Building and 24" Astronomical Telescope, Albuquerque, N.M., May 15:

"Properties of the Solar Wind in the Vicinity of the Earth" by M. D. Montgomery, P-4.

"Solar X-Ray Emission Between 16-40 Å" by W. D. Evans, P-4.

Symposium on Diagnosis and Treatment of Deposited Radionuclides, Richland, Wash., May 15-17:

"Chelating Agents in Plutonium Deposition—a Minority View" by H. F. Schulte, H-5, and H. O. Whipple, H-2.

"Accelerating the Turnover of Internally-Deposited Radiocesium" by C. R. Richmond, H-4. (Invited paper)

Presentations at 18th Annual Mid-America Symposium on Spectroscopy, Sponsored by Chicago Section, Society for Applied Spectroscopy, Chicago, Ill., May 15-18:

Spectrochemical Determination of Impurities in High-Purity Plutonium by Anion-Exchange Separation and Graphite-Spark Excitation" by J. F. Murphy and R. T. Phelps, both CMB-1.

"Spectrochemical Determination of Niobium, Tantalum and Titanium in Uranium Using Solvent Extraction Separation and Graphite Spark Excitation" by Juanita V. Pena, H. M. Burnett, C. J. Martell and R. T. Phelps, all CMB-1.

"^{17}O NMR in a Single Crystal of D_2O" by P. D. Waldstein and S. W. Rabideau, both CMF-2.

"Low-Frequency Raman Spectra of Acetate and Formate Ions in Aqueous Solution" by L. A. Blatz and P. D. Waldstein, both CMF-2.

Presentation at Meeting of the Los Alamos Nurses Association, Los Alamos, N.M., May 16:

"Radiation Effects" by W. H. Langham, H-4. (Invited talk)

Presentation at 24th Meeting of High Temperature Fuels Committee, Elmsford, N.Y., May 16-18:

"Summary of Recent Work on Ceramic Plutonium Fuel Materials" by J. A. Leary, CMB-11. (Invited paper)

Presentation at California State Polytechnic to Engineering Students and Staff, Kellogg-Voorhis Campus, Pomona, Calif., May 18:

"The Los Alamos Meson Factory" by F. R. Tesche, MP-5.

Presentation at Symposium on Brackish Water Desalination, Salt Lake City, Utah, May 21-24:

"Electrochemical Desalination by a Multistage Bromine Redox Method" by E. I. Onstott, CMB-8, E. F. Thode and K. L. Holman, both New Mexico State University.

Fifth International Conference on Nondestructive Testing, Montreal, Canada, May 21-26:

"Improved Resolution Neutron Radiography" by B. L. Blanks, D. A. Garrett and R. A. Morris, all GMX-1.

Presentation at Colloquium, Department of Nuclear Engineering, University of California, Berkeley, Calif., May 22:

"Time-of-Flight Neutron Cross Section Measurements Using Nuclear Explosions" by W. K. Brown, P-3.

Symposium on Disposal of Radioactive Wastes into the Ground. Sponsored by the International Atomic Energy Agency and European Nuclear Energy Agency at Vienna, Austria, May 29-June 2:

"Solid Radioactive Waste Disposal at Los Alamos—A Ten Year Resume" by J. W. Enders, H-1. (Invited talk)

Vela Satellites Performing Well

Vela satellites numbers 7 and 8—with instruments designed by the Los Alamos Scientific Laboratory for America's "Eye in the Sky" program—are apparently operating satisfactorily.

The twin satellites were launched April 28 from Cape Kennedy and are designed for surveillance of nuclear explosions and to study cosmic and solar radiation. LASL and Sandia Laboratory in Albuquerque have provided instrumentation for all Vela satellites launched to date. Vela means "vigil" in Spanish.

Shortly after the launch the satellites were maneuvered into their circular orbit 70,000 miles above the earth's surface, and the instruments were turned on. A preliminary report from a satellite monitoring center in California said: "Everything looks fine so far."

LASL scientists reported the new type of instruments designed to study the intense solar flare radiation worked as planned. This type of radiation presents one of the greatest threats to manned space missions. The intensity is great enough to threaten the life of man, and it is important to learn more about the character of this kind of radiation.

The Vela project is a joint Atomic Energy Commission—Department of Defense program.

new hires

Accounting Office

David A. Black, Los Alamos, AO-4
Abbie Consolino, Los Alamos, AO-4
Thomas J. Ruiz, Los Alamos, AO-4
John F. Schoeppner, Santa Fe, AO-4

CMB Division

Kenneth L. Hill, Albuquerque, CMB-3
Barbara M. White, Los Alamos, CMB-8 (rehire)
Kaye A. Johnson, Santa Fe, CMB-11 (rehire)
Clinton C. Ackerman, Durham, N.C., CMF-9

D Division

Arlo D. Martinez, Fairview, N.M., D-2 (casual)
Julia A. Gauthier, Los Alamos, D-8

Engineering Department

Lucille E. Wood, Los Alamos, ENG-5 (casual)
Raymond E. Miller, Albuquerque, ENG-6

GMX Division

Gary R. Redmore, Buffalo, N.Y., GMX-3
Gerald A. Gallegos, Las Vegas, Nev., GMX-7
Barry L. Carlson, Los Alamos, GMX-8
Barry N. Lenhart, San Diego, Calif., GMX-9

J Division

Paul E. Schell, Albuquerque, J-9 NRDS
Earl Strain, Las Vegas, Nev., J-9 NRDS

K Division

James H. Havens, Albuquerque, K-3

MP Division

Roger G. Schamaun, Albuquerque, MP-AE
Joseph H. Vigil, Santa Fe, MP-1
William C. Barnett, Phoenix, Ariz., MP-1
Rae N. Ridlon, Albuquerque, MP-2
Larry C. Garreffa, Santa Fe, MP-5

N Division

Albert E. Evans, Jr., Silver Spring, Md., N-6

P Division

Robert J. Payne, Denver, Colo., P-9

Shops Department

Memory J. Cummings, Los Alamos, SD-DO
Gomer J. Gray, Chillicothe, Mo., SD-DO (rehire)
Jack E. Dyson, Mansfield, Ohio, SD-1
Harold J. Norden, Cranston, R.I., SD-1
Ernest A. Talachy, San Juan Pueblo, N.M., SD-2
Richard F. Clark, Jr., Washington, Pa., SD-5
Robert D. Stelzer, Sr., Mansfield, Ohio, SD-5
Helario Valdez, Espanola, N.M., SD-5

T Division

David E. Schultz, Boulder, Colo., T-1
Gary S. Fraley, Pasadena, Calif., T-2
John L. Gammel, College Station, Texas, T-9 (rehire)

W Division

James E. Greening, Albuquerque, W-1

J-11 Receives One-Fifth of World's Pu^{244}

A group of Los Alamos Scientific Laboratory radiochemists have started a series of experiments utilizing a portion of the largest and purest sample of plutonium 244 ever to become available.

LASL Group J-11 recently received 1.5 milligrams of highly enriched Pu^{244}—one-fifth of the world's known supply. This material was produced by irradiating Pu^{242} in the Oak Ridge National Laboratory High Flux Isotope Reactor (HFIR). An ORNL calutron was then used to isolate the small amount of Pu^{244} from the lighter plutonium isotopes.

Darleane Hoffman, J-11, unpacks rare sample of Pu^{244}.

Similar samples have also been distributed to Argonne National Laboratory and the Lawrence Radiation Laboratory at both Berkeley and Livermore, and one was retained by ORNL. This Pu^{244} was produced as a part of the AEC's program to create higher mass isotopes of the transplutonium elements in research quantities.

The LASL sample will be used as a target material to make other nuclides—some already discovered, others undiscovered but predicted. Attempts will be made to determine the energy and decay schemes of these nuclides.

The first of a long series of experiments has been started by irradiating the Pu^{244} in the LASL Water Boiler reactor to produce Pu^{245}. A good gamma spectrum has been obtained from this isotope, and decay studies are under way.

Pu^{244} is the most stable plutonium isotope—with a half-life of about 8 x 10^7 years—and because of this and its relatively high atomic weight, it is particularly useful as a target material for nuclear studies.

For the layman interested in just how large 1.5 milligrams of plutonium is: in the shape of a ball, it would be only slightly larger than one of the periods on this page. But to the radiochemist this is sufficient for many and long continued experiments. Because of its long half-life, the newly-arrived sample can be used over and over again, since only a negligibly small fraction of the Pu^{244} will be lost by transmutation to other nuclides in these experiments.

As one radiochemist quipped, J-11 will use the sample "until the atoms are worn out."

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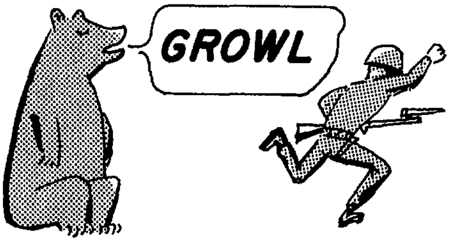


years ago in los alamos

Culled from the files of June, 1947, Los Alamos Times by Robert Y. Porton

Atom Leadership Depends on Top Laboratory Talent

All lines flow to Los Alamos in the atomic energy program, including plutonium from Hanford and U-235 from Oak Ridge, it was pointed out in testimony given the House Appropriations Committee in hearings on the AEC budget by chairman David E. Lilienthal and general manager Carroll L. Wilson. "Less than two years ago," Wilson said, "the first atomic bombs were made. Los Alamos is more than a research laboratory. It is one of the best equipped metal-working and chemical laboratories including production and testing facilities of all sorts. If we are going to retain a position of leadership in this field, this laboratory must be one that will attract the best talent in the country. It must provide an environment that is conducive to creative work."

Site Men Given Key Positions

Several Los Alamos Scientific Laboratory employes occupy key positions in the recently chartered New Mexico Section of the American Chemical Society. Included are Melvin L. Brooks, group leader, X-2 Division, chairman; and Charles F. Metz, group leader, CMR-1 Division, treasurer.

The Story of GI Joseph

At 1:30 a.m. Friday, PFC Arthur F. Joseph was walking his post between two warehouses. Upon hearing a loud growl from behind a partly-constructed fence, he peeked through and saw a large bear. Before you could say "Goldilocks," the MP with his 30-calibre rifle was atop one warehouse where he sought a vantage point for shooting. The animal took to cover under brush.

An hour later Private Joseph was toying with the idea of descending from his perch when he heard another growl—softer, indicating the mate. A series of love calls went back and forth until near dawn when the sentry was relieved of duty. Neither of the bears has been seen since.

Warden Warns Site Fishermen

Los Alamos sportsmen were warned this week by a Taos game warden that they are subject to punishment by fine if caught fishing out of season in tributaries of the Rio Grande. Mentioning no names, Warden Thomas Holder said he had come upon several Hill fishermen recently who were casting in tributaries of the Rio which are closed to fishing at this time.

what's doing

FILM SOCIETY: Civic Auditorium. Admission by single ticket, 90 cents, or season ticket, $4.

- Wednesday, June 21, 7 and 9:15 p.m., "Letters from My Windmill," droll French comedy.

OUTDOOR ASSOCIATION: No charge, open to the public. Contact leader for information about specific hikes. Meetings at High School Little Theater June 20, July 18, Aug. 15, 7 p.m.

- Saturday and Sunday, June 17-18, Latir-Little Blue Lakes, Bill McKee, leader, 2-4988.
- Thursday, June 22, evening hike, B. Skaggs, leader, 2-3687.
- Thursday, June 29, evening hike, Ken Ewing, leader, 8-4488.
- Saturday, July 1, Brazos Cliffs—Brazozs Meadows Area, Norris Nereson, leader, 2-3856.
- Thursday, July 6, evening hike, Stretch Fretwell, leader, 2-6477.

MESA PUBLIC LIBRARY EXHIBITS:

Art Exhibits:

- June 6 to 30—Paintings by Eleanor de Ghize, Santa Fe.

Case Exhibits:

- June 1 to 23—Sketches of Quemazon Nature Trail by Avery Nagle, Los Alamos.

LASL MEN ON TV: Wednesday, June 21, 7:30 p.m., Channel 5, "The Living Sun," a film featuring LASL's 1966 solar eclipse expedition.

DON JUAN PLAYHOUSE: Outdoor theater between Los Alamos and Santa Fe, near San Ildefonso Pueblo. Tickets at box office, at Decol's in Los Alamos and the Centerline Shop in Santa Fe. Curtain 9:15 p.m.

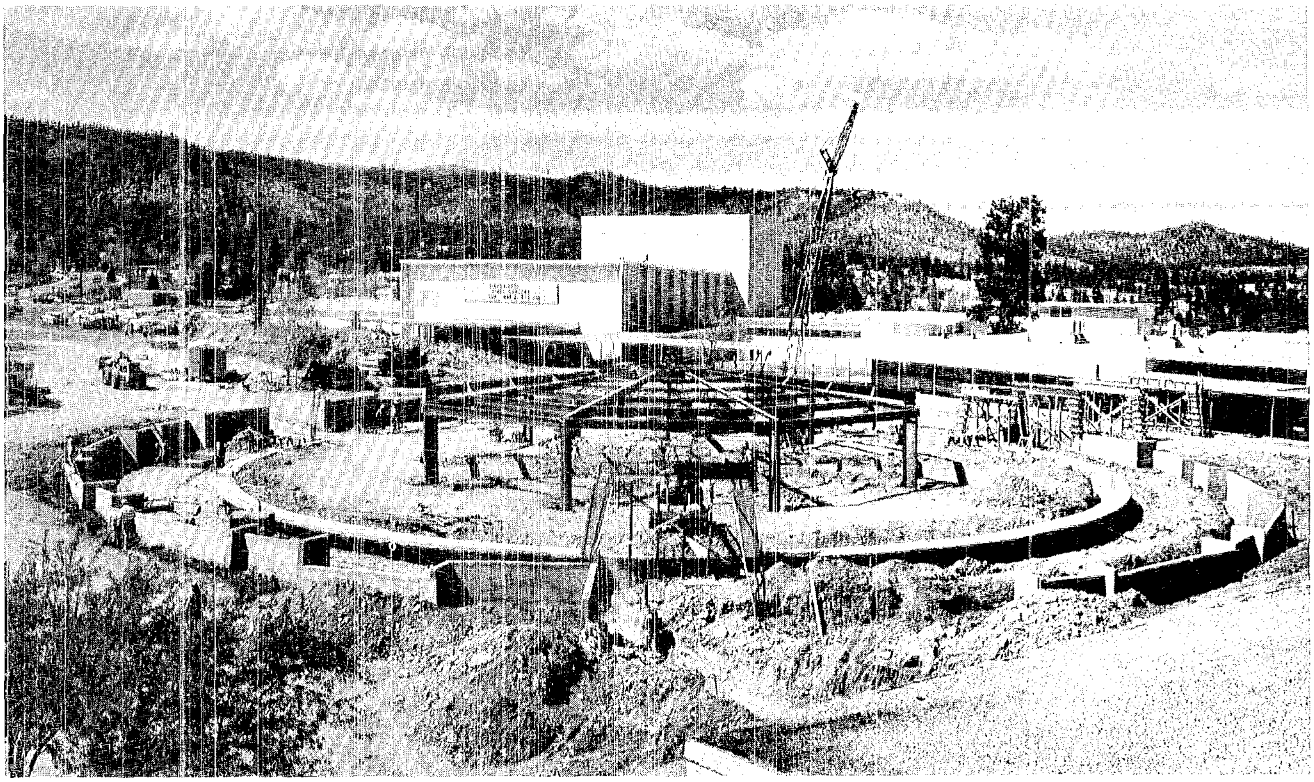
- Friday and Saturday, June 23 and 24—"Behind the Paper Faces," by Bruce Harrison. (Also on Friday, July 14, and Saturday, July 15).
- Friday and Saturday, June 30 and July 1—"Irma La Douce," musical comedy. (Also on Friday, July 21, and Saturday, July 22).
- Friday and Saturday, July 7 and 8—"Who's Afraid of Virginia Woolf," by Edward Albee. (Also on Friday, July 28, and Saturday, July 29).

SANTA FE OPERA: Tickets available at Los Alamos Building & Loan, beginning June 19, on Mondays, Wednesdays and Fridays from 10 a.m. to 1 p.m. Curtain time 8:30 p.m.

- Saturday, July 1—"Carmen"
- Wednesday, July 5—"La Boheme"
- Saturday, July 7—"Carmen"
- Saturday, July 8 and Wednesday, July 12—"The Barber of Seville"
- Friday, July 14—"La Boheme"
- Saturday, July 15—"Carmen"

SANTA FE THEATRE COMPANY, performing in the Greer Garson Theatre, Santa Fe. Premier season, June 14-Sept. 3. Performances Wednesdays through Sundays. For information call 982-6511.

- June 14-25—"The Rose Tattoo"
- June 28-July 9—"Barefoot in the Park"



The new Los Alamos High School "learning center," which will enable students to conduct individual research and independent study at their own learning pace, is expected to be completed by December or January. The building will have a floor area of approximately 11,000 square feet and is being constructed at a cost of about $265,000. The structure is primarily a library, but school officials note it will encompass much more than the traditional library. In addition to books, it will contain tapes, records and films. There will be social studies and research rooms in one section, and between these rooms will be a large conference room which can be subdivided.

BACK COVER:

Unidentified flying objects of all kinds will interest Los Alamos youngsters this summer. Mesa Public Library's summer UFO Reading Club for all reading age children will begin June 19 and continue for seven weeks. Opening day will feature a talk on UFOs by Charles Fenstermacher, J-18, and special programs and entertainment will be featured each week. Many new books, including paperbacks, will be released on opening day of the club. Watching the UFO over the library are Rob Brown, son of the David Browns (Eng-6) and Sona Rodgers, daughter of the Bill Jack Rodgers (Pub photographer).

Henry T. Motz
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